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A Half-Century of the Massachusetts Public Health Association*

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WE are here tonight to commemorate a beginning, one of the most notable beginnings in the history of American public health, for the founding of the Massachusetts Association of Boards of Health was an event of importance far beyond the confines of its native Commonwealth.

In connection with any such occasion, I always think of a poem by Muriel Stuart called "The Seed Shop" which to me stands as an almost perfect symbol of the latent power of germinal things. She says:

Here in a quiet and dusty room they lie,
Faded as crumbled stone or shifting sand,
Forlorn as ashes, shrivelled, scentless, dry—
Meadows and gardens running through my hand.

. . . . . .

In this brown husk, a dale of hawthorn dreams;
A cedar in this narrow cell is thrust
That will drink deeply of a century's streams,
These lilies shall make summer on my dust.

Here in their safe and simple house of death,
Sealed in their shells, a million roses leap;
Here I can blow a garden with my breath,
And in my hand a forest lies asleep.

Such a seed-bed—full of rich promise of future blossoming—was the organization of the Massachusetts Association of Boards of Health, 50 years ago. To understand its full significance, we must consider the background of the times, and measure the progress made since 1890.

The Twenty-first Annual Report of the State Board of Health of Massachusetts for 1889 will give us such a reference point. The board, at that period had a budget of $44,000, of which $26,000 was spent for work on water supply and sewage disposal and $10,000 on control of food and drugs. The introductory report of the board itself devotes more than half its space to epidemiology and isolation of such diseases as smallpox, diphtheria, scarlet fever, and typhoid.

One may gain an even better picture of the theoretical knowledge of the period by turning to such a contemporary textbook as Coplin and Bevan's *Manual of Practical Hygiene,* published in 1893. Its first chapter on the Cause and Prevention of Disease and a final chapter on Technic give us a glimpse of the new world of Bacteriology which was opening to the vision of the early

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90's. Here, the production of disease by germs is clearly recognized, and nearly 20 of the organisms now known to be associated with those diseases are briefly described. Quarantine, isolation, and disinfection are discussed and Pasteur's work on chicken cholera is cited as possibly opening the way to an artificial control of immunity. The final chapter on Technic describes the microscope and simple bacteriological procedures for staining and culturing and for the examination of sputum, blood, and feces. These two chapters include Coplin and Bevan's highly creditable outlook toward the future. The rest of the book is based on the past and deals almost exclusively with traditional teachings in regard to personal hygiene and environmental sanitation. The longest chapter in the volume is on Habitations and deals exhaustively with heating and ventilation, plumbing, building construction, and home planning. In spite of its emphasis on the carbon-dioxide standard for atmospheric impurity it is more practical and helpful than the treatment of housing in any 20th century textbook on hygiene with which I am familiar.

On the whole, however, it is clear that the basis of the health program of the 90's included three major elements: a body of vague and ill-substantiated empirical observations with regard to personal hygiene, much of it coming down from Galen but vitalized by the pioneer studies of Pettenkofer and his school at Munich; a clear and basically sound conception of the importance of environmental sanitation grounded in the experience of nearly 50 years of sanitary reform initiated by Chadwick in England; and a crude but valuable technic of isolation and disinfection gradually developed from the procedure of the books of Leviticus and Deuteronomy, through experience with leprosy, bubonic plague, and cholera, from the Middle Ages down. This basic empirical knowledge was just beginning to be touched—but was not yet transformed—by the germinating science of bacteriology. As Dr. F. P. Denny has said, in his excellent historical sketch of the Association:

> The activities of Boards of Health in 1890 were practically limited to the quarantining of cases of diphtheria, scarlet fever, and smallpox, and the abatement of nuisances. Tuberculosis was not reportable. There were no sputum examinations, and practically no hospital beds for cases of this disease. There were no state or municipal laboratories, no cultures for diagnosis of diphtheria. The carrier state was unknown. Typhoid cases were frequent, but an important step towards the elimination of that disease had just been taken in the establishment of the Lawrence Experiment Station. Supervision of municipal milk supplies was negligible . . . Public Health in 1890 was thus an almost virgin field.

It was in this primitive intellectual climate that Dr. J. C. Coffey, Health Officer of the City of Worcester, had the courage to visualize the organization whose first half century of service we are celebrating. On November 8, 1889, L. F. Woodward, Chairman of the Worcester Board of Health, sent out a letter suggesting the organization of an association "to discuss topics of sanitary interest, to aid legislation and secure enforcement of existing statutes, to compare rules and ordinances of local boards, to secure coöperation for suppression of disease." On January 11, 1890, the organization meeting was held with 35 persons present, and on March 19, at the first regular meeting of the Association, Dr. H. P. Walcott (Chairman of the State Board of Health from 1886 to 1914) was elected President, Dr. S. H. Durgin (Health Officer of Boston from 1873 to 1912) Vice-President, and Mr. Woodward, Secretary.

As Dr. Denny has said,

> The original membership of the Association was comprised largely of Chairmen, members,

and agents of Boards of Health. They had no training whatsoever, although many had considerable experience. None had any knowledge of the basic sciences, especially bacteriology, on which progress in public health was to depend so largely. Except for these meetings of the Association, and the *Journal*, there was no opportunity for those connected with Boards of Health to get information as to how their procedures might be improved.

Through the machinery of the Association, however, these earnest but untrained servants of the state were brought into contact with the brilliant minds directing the Massachusetts State Board of Health in its pioneer work on water and sewage, with Dr. Charles V. Chapin (Health Officer of Providence, R. I., from 1884 to 1931) and with Prof. W. T. Sedgwick (Professor of Biology at the Massachusetts Institute of Technology from 1883 to 1921) and his staff. It is difficult to exaggerate the supreme value of the cross-fertilization between theory and practice which ensues from such a meeting ground for practical field workers on the one hand and university investigators on the other.

My personal contact with the Association began in 1898 when I was a senior student at Technology under Sedgwick. Walcott and Durgin were still serving as President and Vice-President of the organization, posts which they continued to fill till 1913. I remember well the meetings held in the grill-room of the Hotel Brunswick in winter and down the harbor in summer. I have still on my shelves the early issues of the *Journal of the Massachusetts Association of Boards of Health* (first issued in 1901, changed to the *American Journal of Public Hygiene and Journal of the Massachusetts Association of Boards of Health* in 1904, to the *American Journal of Public Hygiene* in 1910, and turned over to the American Public Health Association to become our national public health organ in 1911). I came to know well most of the pioneer leaders of the Association.

Walcott remained an Olympian figure, stately and remote, only appearing on some special great occasion. Durgin, however, scarcely missed a meeting and was the usual presiding officer. He was small, prim and precise, with a curious trick of rocking up and down slightly on the balls of his feet. He was a trifle pompous, with a keen sense of the importance of his position in the community and, though known as "Sammy" in third-party conversation, no one took any liberties with Dr. Durgin to his face. I recall vividly one occasion at a State House hearing on an anti-vaccination bill, where a speaker tried to heckle him because a ship in the harbor with a smallpox case on board had been allowed to dock before the established quarantine period. "Gentlemen," he said, rising slightly on his toes, "I hold the public health of Boston in one hand and its commerce in the other." A good maxim for the health officer, if the scales be not allowed to dip too far; and Dr. Durgin held the balance true.

Of Sedgwick, it is more difficult to speak because my association with him for 15 formative years of my life was so close and intimate. To all who came under his influence even in slight degree he was the beloved teacher. He had at least three very great qualities. The first was a power of visualizing relationships, of seeing every phenomenon in relation to other phenomena, past, present, and to come. He took a fact or an idea and tossed it up in the air like a ball so that it could catch the reflection of light from every quarter. I recall vividly a session in Plant Physiology where nearly the whole hour was spent in discussing why Catholics have stained glass windows in their churches and certain Protestant

sects do not. The rôle of a flower in plant life was the key to an understanding of the part played by esthetics in human experience. Professor Sedgwick never liked me to tell that story; but to my mind it perfectly exemplified his gifts as a teacher.

In the second place, Sedgwick had a rare gift of rationality and of reasonableness, which has a slightly different connotation. He was completely ready to follow the truth wherever it might lead; but he had a wise and wholesome respect for authority and even for the empirical views of mankind in general, which he always pointed out were likely to contain fundamental elements of truth. Once in a class when I was contending a little brashly for some callow theory he tipped back in his chair, looked out of the window, and remarked, "It is possible that the scientific world is wrong and Mr. Winslow is right; but it is more probable that the scientific world is right and Mr. Winslow is wrong." I have never forgotten that lesson.

The third outstanding quality of Sedgwick was his sublimely complete and quite automatic sense of social responsibility. Once when I had a long talk with him about my career he said, "Well, Winslow, I think you can be a very useful man." Not a rich man, not a successful man, but a useful man. It never entered his head that anyone could have any other motive than to be useful. He assumed, without any question, a fundamental honesty and unselfishness in every human being. It was most amusing when he assumed public office as a trustee of the Pauper Institutions of the City to see the impact of this attitude on somewhat hardened politicians. They were at first surprised and somewhat uncomfortable; but they were ashamed not to live up to the astonishing standards set, and they did live up to those standards while they worked with him. In my years of observation of Sedgwick's contacts with his pupils, the number who disappointed his expectations was very small, for human nature is a complex thing and you can find in it good or evil, depending on the touchstone you apply.

Finally, a word must be said about Chapin, the third member of the triumvirate who guided the thinking of the Association in its early days. He is not merely a historic figure but a living and beloved friend; and I suggest that we send from this meeting a special greeting to Dr. and Mrs. Chapin on this occasion. In person, quiet and unassuming, gentle and gracious, warm-hearted and companionable, in the field of public health science, he has been one of the great creative figures to whom, more than to any other thinker, we owe the modern concepts of epidemiology and the present-day program of administrative procedure.

It was peculiarly fortunate that the health workers of Massachusetts could have the guidance of such men as Chapin and Durgin and Sedgwick in the last decade of the 19th and the first decade of the 20th century. Never before, nor since, has there been such a rapid unfolding of new knowledge which had to be interpreted and transmuted into administrative practice.

In 1890, the Lawrence Experiment Station published its first classic report on sewage treatment, and vonBehring first treated diphtheria with antitoxin.

In 1892, Smith and Kilbourne presented their brilliant report on Texas fever, Park in New York and Koch in Germany first demonstrated the importance of the carrier state, and Park first developed bacteriologic control of diphtheria on a practical administrative basis. Here in Massachusetts, Sedgwick, in the 1892 Massachusetts State Board of Health Report, made the first

great contribution of American epidemiology and before this Association presented a pioneer paper on the bacteriology of milk.

In 1893, the completion of the Lawrence filter initiated modern water purification in America. Biggs in New York established the first administrative program for the control of tuberculosis.

In 1894, Boston inaugurated the first system of medical school inspection in the United States, and Cameron described his septic tank.

In 1896, Wright, Pfeiffer, and Kolle began vaccinating against typhoid fever, and Widal introduced his blood test.

In 1897, Shiga discovered the dysentery bacillus, and Ehrlich developed his theory of immunity, while Ross made his basic researches on malaria.

In 1899 came the demonstration of the mode of transmission of yellow fever by Reed and three associates (Carroll, Lazear, Agramonte) at Havana and of typhus fever by Nicolle.

In 1901, Bordet and Gengou introduced the complement-fixation test.

In 1902, Chapin presented before this Association his first clear challenge of the traditional filth theory of disease, the initial step in his classic work on Sources and Modes of Infection, published in 1910. In the same year, Miss Wald initiated school nursing in New York City.

In 1903, tuberculosis nursing was initiated in Baltimore under the leadership of Osler.

In 1904, the National Tuberculosis Association was founded.

In 1905, the germs of syphilis and whooping cough were discovered.

In 1906, the Wassermann test was introduced, and Hopkins began his studies on accessory food factors.

In 1907 von Pirquet introduced the skin reaction in tuberculosis.

In 1908, chlorine was first used in the treatment of a municipal water supply at Jersey City, and the first Division of Child Hygiene was established by the New York City Health Department.

In 1909, the National Committee for Mental Hygiene was organized.

In 1910, Ehrlich discovered salvarsan.

Is it any wonder that, during these 20 years, progress in the new science and art of public health was rapid and spectacular? In the State of Massachusetts during the period of 21 years between 1889 and 1910, the diphtheria rate decreased by 80 per cent, the typhoid death rate by 70 per cent, the death rate from pulmonary tuberculosis by 48 per cent, the infant mortality rate by 17 per cent, and the death rate from all causes by 16 per cent.

The year 1910 may conveniently be taken as marking the limit between two major phases of emphasis in the public health campaign. Between 1890 and 1910, it may fairly be said that the health officer was preoccupied with two major objectives, the sanitation of the environment on the one hand, and isolation and artificial control of immunity on the other—both of these objectives relating to the defense of human beings against the germs of communicable disease. The traditional sanitation of the environment which had formed the basis of the sanitary awakening in the 19th century and the empirical quarantine procedures which had come down through the Middle Ages were revivified and made precise and effective by the new science of bacteriology. The sanitary engineer and the bacteriologist were then the chief protagonists of public health, the first eliminating typhoid by the purification of water supplies and the second robbing diphtheria of its terrors by the use of antitoxin.

A new emphasis, however, had al-

ready begun to manifest itself. The foundation of the National Tuberculosis Association in 1904, and of the Society for Sanitary and Moral Prophylaxis in 1905, of the Association for the Prevention of Infant Mortality and the National Committee for Mental Hygiene in 1909, opened a widely different vista. The founders of the tuberculosis movement and the infant welfare movement were interested, it is true, in disinfection of sputum and in the pasteurization of milk. They were also concerned, however, with the vital resistance of the individual. Emphasis shifted from inimical forces in the physical environment to resources of power in the physiological organism. Health became, for the first time since the days of Ancient Greece, a positive ideal; and this ideal could be realized only through focusing educational and reconstructive forces on the individual human being. Public health was no longer concerned only with the maintenance of a sanitary environment but with the strengthening of the individual for the war against disease.

With this change of emphasis, came a notable enlargement of public health personnel. The sanitary engineer and the inspector, the laboratory worker and the epidemiologist, were still of vital importance; but alongside them, new figures appeared. To develop habits of healthy living we needed machinery for personal education; and we turned to the visiting nurse and transformed her into the public health nurse. A few pioneers had seen this vision very early. Florence Nightingale conceived of the nurse as a "health missioner" and here in Boston you founded an organization with the illuminating title of Instructive District Nursing Association as far back as 1886—a historically glorious name, which has been regrettably abandoned. It was only after 1905, however, that rapid development of public health nursing took place. In 1902 there were only 136 such nurses in the United States, while in 1912 there were over 3,000. Today we wisely spend one-third of our total health budget on public health nursing.

It was this second major phase of the public health movement which first really brought the physician into the movement. In the early years of the century the health officer might or might not be a medical man but his major tasks were engineering and bacteriological. Today, the whole picture has changed. Prenatal clinics, infant welfare conferences, tuberculosis clinics, syphilis clinics, cancer clinics, heart clinics, mental hygiene clinics, are operated by the health department and by voluntary health agencies. Preventive medicine has become, not merely a phrase, but a reality. The physician rather than the engineer has become the central figure in the picture.

The results of the last three decades have been even more brilliant than those of the two which preceded them. Sanitation and bacteriology have continued to accumulate health dividends and educational nursing service and preventive medicine have added their quota to the profits. Here, in the State of Massachusetts, the 1937 mortality figures, as compared with those of 1910, show further reductions of 98 per cent in diphtheria, 97 per cent in typhoid fever, 92 per cent in measles, 88 per cent in scarlet fever, 70 per cent in pulmonary tuberculosis, 67 per cent in infant mortality, and 27 per cent in deaths from all causes.

The process of integrating medicine into the public health program and making it really effective as a preventive force is as yet by no means complete. It has made excellent progress in the fields of infant welfare and tuberculosis control and is beginning to be effective in the case of syphilis and—particularly in this state—in the control of cancer. The successes at-

tained have, however, only emphasized the need for more effective means of putting medical science to work so as to attain its maximum effectiveness. There is no longer any sharp line between prevention and cure. Almost every medical treatment—if successful—cures, so far as possible, disease processes already initiated and, at the same time, prevents those processes from going further. If the public health program is to attain its ultimate goal, the entire medical resources of the nation must be utilized to their full capacity.

That they are not now so utilized, has been made abundantly clear in many recent studies. In spite of our high proportion of physicians, our luxurious hospitals, our magnificent institutions for teaching and research, the economically less fortunate moiety of our population receives less than half of the physician's care, only three-quarters of the hospital care, only one-fifth of the dental care, and only one-tenth of the special nursing care utilized, and wisely utilized, on a higher economic level.

The problem here is basically an economic one. These people do not go without medical care because they do not want it, or because they do not need it. On the contrary, as we go down the economic scale and find less and less medical care, we also find more and more sickness. The lack of care is due to a lack of financial resources to pay for such care. Hence, the current discussion of the possibilities of health insurance.

In this discussion we must be on our guard against over-simplification of the issues. Not all of the American people need health insurance. As I pointed out in a discussion before the Town Hall Forum in New York some ten days ago, there is a small section at the upper economic level of our population which does not need any change in the present situation. They can now obtain the best medical care available and they can pay for it by the use of profits and reserves. They are self-insured.

There are much larger groups of people in the United States, however, who do urgently need health insurance. Sickness is not an average problem but an emergency. In general, at any income level, it appears that in a particular year one family out of each hundred has medical bills amounting to between one-fourth and one-half of its total annual income, while other families in that year have no medical costs at all.

The answer to such an unequal distribution of costs is of course very obvious. We deal with the other emergencies of life: fire, theft, death, by insurance—that is, by the pooling of the financial resources of a group of people over a period of time. It is obvious that the only way in which a family on the middle economic level can pay its medical bills is by the application of the same principle.

Below the small group of the wealthy is a second group which needs some form of insurance against the emergency costs of medical care but is sufficiently well off to purchase such service on a voluntary insurance basis. This is the group which can readily pay the average cost of medical care but which cannot budget for the unpredictable emergencies of sickness. It needs health insurance, but not necessarily compulsory health insurance.

More than three million of our population now purchase voluntary insurance to cover the costs of hospital care, and, through the development of such organizations as those represented in the Group Health Federation of New York, we have even more significant results in regard to voluntary insurance covering physicians' care as well. Voluntary insurance of this sort has developed new technics of distributing

medical care which offer real hope of achieving in practice the unrealized potentialities of modern scientific medicine; and it is contributing materially to the knowledge of administrative procedure and of the cost of adequate medical care essential to future organization in this field.

There is a third group in our population for whom no system of voluntary insurance can suffice. The families in this considerable group cannot pay even the average cost of medical care with sufficient ease to make them potential members of voluntary groups, and many of them can only pay a part of this average sum. Compulsory health insurance is the means by which health service can be extended to those who can pay only a part of the full average cost of medical care, through contributions to the fund by the employer and by the government—a provision included in all insurance acts. Thus, there is a considerable section of the population of the United States, primarily in its industrial areas, which needs and urgently needs compulsory health insurance, and within the general framework of our existing social order cannot obtain adequate medical care in any other way.

Finally, for the indigent in the cities and for the general population in many rural areas (where the social and economic conditions necessary as a background for insurance are lacking), an organized system of medical care supported from the tax levy is the only solution.

There is no simple answer to the question, nor any single panacea for the solution of the problem of medical care. For various sections of the population we need the traditional system of individualistic medical care, we need voluntary insurance, we need compulsory insurance, and we need an expansion and a far better organization of tax-supported medical care for the indigent in our cities and for the population of our rural areas. We need, in other words, a broad national health program employing various procedures, in the sense in which it was formulated by the conference held in Washington during the summer of 1938. Progress must be gradual and evolutionary; but if any progress at all is to be made it is essential that federal grants should be available to stimulate experimentation by the various states. We stand still and quarrel about details and about hypothetical damage to our vested interests, while men and women and children suffer and die for the lack of the resources of modern medical science. Let us forget slogans and avoid vague terminologies which arouse the secretion of the endocrine glands instead of stimulating the higher nerve centers. Let us recognize that the situation is serious and calls for action. Let us remember that there is no single easy solution of the problem, but that what we need is a national health program so constructed as to enable the people of these United States to obtain and to pay for the medical care that they need, whether they pay for it as individuals, as groups, or as taxpayers.

So much for the past, and for the most pressing problem of the present—the development of an orderly and effective program of medical care for the American people. What can we today surmise as to the problems which the Massachusetts Public Health Association will be called to meet in the future?

It is always dangerous to prophesy, but it seems to me clear that the major results to be expected in the reduction of mortality rates have nearly been reached. In the past half century, the death rate per 1,000 has, as we have seen, fallen from over 19 to less than 12. If the rate of 12 per 1,000 can be further reduced to 8, we shall be reaching a figure as low as can be reasonably

expected. After all, the human machine is only set to run for a certain period of years. The cycle from birth to death is a fundamental property of organic life. What the public health program has sought to do is to eliminate premature death, to attain the end so charmingly described by Oliver Wendell Holmes in the One-Horse Shay. That end should be accomplished in the half-century to come.

It would be a mistake, however, to assume that the Massachusetts Public Health Association can retire on its laurels when a maximum reduction of the death rate has been attained. With the disappearance of the plagues and pestilences of olden days, with the progressive conquest of more widespread or more chronic maladies such as tuberculosis and syphilis and pneumonia, fresh vistas open up and the very word "Health" takes on a new meaning. Preventive Medicine was a great advance over Alleviative Medicine; but Constructive Medicine—if I may coin a new term for a new ideal—will be better still. Health does not mean merely staying alive. It means, or should mean, something much more positive and dynamic. It should mean vigor and efficiency and joy in living. From this standpoint, the task of the public health worker has only just begun.

Take, for example, the problems of mental hygiene. We know that the number of beds, in any state, in institutions for the care of mental disease and defect is nearly equal to those occupied by patients suffering from all other maladies and defects taken together; and the same ratio holds for the conditions not so serious as to require institutional care. In the average family, the burden of mental and emotional maladjustment is certanly as serious as that produced by the whole gamut of so-called "physical" disorders. Mental hygiene is not a small sector of the public health program but a good half of it. Yet it is an area which today has been scarcely touched.

As soon as we accept this view of the public health objective as Constructive Medicine—the production of a nation of men and women and children possessed of vitality and effectiveness and happiness—the vision of our task correspondingly broadens. We realize, for instance, the importance of nutrition as a central public health problem of the future. Scarcely a month goes by without illuminating discoveries from the laboratory or the clinic which reveal new and unsuspectedly subtle influences of very slight deprivation of essential food elements. A group of workers in a factory who have shown an incapacity to perform their task of matching colors accurately are found to be suffering from a deficiency of vitamin A, although they are perfectly healthy from any ordinary clinical standard. The soundness of the teeth, it is reported, depends on a delicate balance of fluorine in the diet, enough to prevent dental caries and not so much as to cause mottled enamel. Our established standards of vitamin needs, based on the test of mere survival and reasonably normal growth, are almost certainly too low for the optimum promotion of longevity and resistance to disease, of efficiency and full vitality. Indeed, recent experiments have shown that minor deficiency may be even more serious than a gross shortage. The latter causes severe symptoms which attract notice and can be cured; while the former may lead to irremediable organic lesions over a period of months during which no warning symptoms appear.

A second major public health problem of the future is housing. Here, again, it is impossible to prove the health values involved by mere appeal to vital statistics. We find our highest death rates in the slums, it is true;

but no one can say how far these high death rates are the result of the bad housing, *per se*, of the poverty factors which cause people to live in bad houses, and of the physical and mental and moral handicaps which tend to make people poor. Yet if we approach the subject from another angle, it is easy to demonstrate that many aspects of bad housing are definitely inimical to physical and mental and social health. The Committee on the Hygiene of Housing of the American Public Health Association has listed thirty principles of healthful housing which exhibit a demonstrable relation of this sort. Some of them relate to fundamental physiological needs for heat and light and air; some to fundamental psychological needs for privacy, on the one hand, and for normal family life and normal community life, on the other, and for efficiency in the performance of the 60 hours a week of household tasks which the average household demands; some to protection against infection, by adequate and safe water supply, sewerage, and waste disposal and the exclusion of vermin; some to protection against home accidents which cause 30,000 deaths a year in the United States, more even than the death toll exacted by the automobile.

The health officer of the future will have more and more closely interlocking relations with local housing authorities in the choice of sites for new housing projects, in the selection of the tenants for such projects and in the compensatory demolition or rehabilitation of slum dwellings in other areas. Furthermore, if he is alert to the new conception of public health, he will take an active interest in the sound evolution of the housing program as a whole, a program whose very continuance at the moment hangs in the balance of Congressional action.

Similarly, the whole field of recreation presents what is essentially a public health problem, if constructive mental and social health can be visualized as clearly as merely preventive medicine has been in the past Finally, Social Security, in its broadest terms, offers fundamental contributions to the health of the citizen, since economic vicissitudes not only deprive their victims of food and medical care but create those national emotional morasses in which such monsters as a Hitler or a Stalin breed.

All of this, as it seems to me, suggests that public health is today passing through a sea change even more significant than that which occurred 30 years ago. Before 1910, we were concerned almost wholly with the physical environment, with polluted water and milk supplies, with dump heaps, and with the hostile germs of communicable disease. From 1910 to the present time, we have been preoccupied chiefly with the body of man, with the study and correction of its defects and the treatment of its disorders. Today we turn our eyes outward again to the environment, but to a different and more complex environment, to the social environment which man has created for himself and in which he lives and moves and has his being as truly as in the atmospheric ocean whose miasmas challenged the imagination of our predecessors of 1890. Then public health was an engineering science; today it is a medical science; may it not tomorrow be a social science?

If I am correct in this prognosis, there will be here a tremendous challenge to the vision and the courage of our public health profession. The tasks of the future will be more difficult and more complex than those of the past. The diphtheria germ had no friends; the insanitary but profitable tenement has powerful allies. Progress in nutrition, in housing, in social security, is being fought and will con-

tinue to be opposed by powerful vested interests.

Can we meet this challenge? I do not know. But the history of the Massachusetts Association of Boards of Health gives us the ground for a reasonable hope. If you had been present at the first meeting of this Association, could you have imagined that little band of untrained health officers and health inspectors passing from drains and quarantine placards to activated sludge and residual chlorine, to Kahn tests and sera for Type VIII pneumococci, riboflavin and cancer clinics? Perhaps the transition from our present-day administrative health program to a constructive remoulding of the social environment in which we live may be equally possible.

Civilization and democracy are today on trial. Civilization, as I see it, means richness and fulness and beauty of individual living; and democracy, the attainment of that ideal for all the people, and by all the people through their free and voluntary action. If progress is too long delayed, the temptation to seek the short cut of dictatorship may prove irresistible; but by such a short cut both democracy and civilization are destroyed together. I have no doubt of the ultimate outcome. No one trained by Sedgwick to see the pageant of life from the amoeba in the rock pool up to modern society can be a hopeless pessimist. But the process of evolution has its tragic periods of delay and reaction. Europe passed through 8 centuries of intellectual darkness between the years 200 and 1000. If England and France are not successful in their gallant struggle, Europe may face more centuries of the same kind.

As the most fortunate of all the peoples of the earth, we have a peculiar challenge to meet and our success or failure may well be a determining factor upon other continents than ours. Can we remain undeceived by ideological slogans and penetrate the deceit of those who use the term of "liberty" to cloak the fact of "privilege"? Can we keep our tempers and follow the path of reason and experimentation? Have we really the desire to build a society of opportunity for all, such as that of which our fathers dreamed? and have we the patriotism or the Christianity or the sense of justice to realize the desire at some cost to ourselves?

If the answer to these questions is in the affirmative, we can build a new world in the next half century; and, in that building, the science and art of public health must play a leading part.

Approaching the Health Problems of Adult Life Through Industry*

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THE health problems of adult life in industry are the occupational diseases and the ordinary diseases found in any adult group, regardless of employment. Both groups of diseases are being approached with good effect—the occupational diseases through industrial hygiene methods and the ordinary diseases through preventive medicine and public health.

However, owing to extensions in the scope of compensation, employers occasionally find themselves responsible for certain of the ordinary diseases. Therefore, industrial doctors are broadening their occupational disease control programs to include measures for the prevention of disabilities from ordinary sickness. These measures can be discussed under the following headings:

1. Special Disease Control Programs
2. Early Diagnosis Campaigns
3. Routine Case Finding Procedures, commonly called physical examinations but preferably known as health examinations

1. *The Special Disease Control Programs* apply to those diseases that are of industrial or quasi-industrial importance from a compensation standpoint. They are:

a. The occupational diseases
b. Tuberculosis
c. Syphilis
d. Diabetes

2. *The Early Diagnosis Campaigns* apply to those diseases that are of no industrial importance, except as causes of disablement. However, their early diagnosis is distinctly beneficial to the employees affected and, therefore, beneficial to industry. These are:

a. Appendicitis
b. Cancer
c. Pneumonia
d. Anemia
e. Pregnancy
f. The communicable diseases

3. *The Routine Case Finding Procedures* apply to a miscellany of diseases or conditions that appear as physical handicaps when workmen reach middle age. They are of growing importance to industry because, despite general opinion, all of industry does not discard employees simply for age.

Incidentally, the average age of workers in certain trades is rising. In General Motors Corporation for 1938, it was slightly less than 40, and 38.9 per cent of the entire employee group were over 40 years old. This means that practically two-fifths of all of the corporation's employees come within this class. Their special health problems, mostly of a chronic nature, are:

a. Diseases of the heart, vascular and renal systems
b. Diseases of the alimentary tract
c. Diseases of the nervous system
d. Genitourinary conditions
e. Goiters
f. Arthritis (rheumatism)

* Read at a Joint Session of the Health Officers and Industrial Hygiene Sections of the American Public Health Association, at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 20, 1939.

g. Hernia
h. Focal infections

There are unquestionably many other diseases occurring in the industrial age group, but the above are selected because of their approachability through industry, and collectively their prevention or control offers a task of sufficient magnitude for the present.

A few out of each class will now be considered as examples to illustrate the opportunities of industry for coöperation with the health authorities and practising physicians and vice versa.

1. a. *The Special Occupational Disease Control Program*—This consists of the following:

(1) Knowledge of harmful materials, operations, processes, and working environments, known as "exposures."

(2) Control of exposures by industrial hygiene methods.

(3) Physical supervision of exposed workers. This entails proper or safe placement of workers and suitable examinations often enough for protection against the exposures.

(4) Treatment of diseases, usually by plant doctors, but occasionally by family doctors or specialists.

(5) Reporting of diseases. All diseases, whether disabling or not, should be reported to the health department.

Back of this program, and contributing greatly to it, is an immense amount of research developed largely by the U. S. Public Health Service, a few of the older and well established state bureaus of industrial hygiene, certain institutions of learning, some industrial toxicologic laboratories, and a scattering of physicians. Without such a background, industrial medicine would be greatly handicapped in its efforts to prevent occupational diseases. With it, considerable progress is being made, despite the fact that relatively few manufacturing establishments have the benefit of expert guidance.

On the contrary, a large proportion of the workers are employed in plants which are served in this respect by general practitioners who have little knowledge of occupational disease exposures and are not interested in them, but prefer only to treat injuries as they happen. This is said with no intent to criticise the general profession, because industrial medicine as now practised is somewhat new, but to suggest that if the profession wishes to take advantage of the opportunity, which it more or less insists upon it, it should prepare itself adequately for the service.

In the meantime, the engineering profession, to a considerable degree, has moved over into the field of industrial hygiene and is doing an excellent job in large industries particularly, and state departments of health have created bureaus of industrial hygiene which give promise of doing equally well in the small industries. The medical service of large plants also is becoming quite skillful in applying industrial hygiene methods. The weak spot is in the large sector of the profession that cares for the workers of small plants. This calls for instruction from those who are informed, and while departments of health are not especially prepared for educational activities, the health officers can accomplish a great deal by way of instruction through the industrial hygiene bureaus. Therefore, the occupational disease control program is left with this thought, that the official health agencies prepare themselves for leadership in the field of industrial hygiene—for its promotion, rather than its accomplishment. The latter should, in my opinion, be left with the industrial hygienists, the doctors, and the employers.

Note: To a considerable degree, the occupational disease control program is the basis of all disease prevention measures, in that it tends to give the workers healthy working conditions and through physical supervision, offers them an instrument for case finding.

1. b. *The Tuberculosis Control Program* consists of the following:

(1) Tuberculin tests supplemented by x-rays of chest in positive cases, or x-rays of all. These should accompany the routine health examinations, but there is no great objection to a quick survey of the plant population.

(2) Safe placement of inactive cases, with suitable physical supervision during employment.

(3) Conference with family physicians regarding active cases as soon as they are discovered. This usually terminates the responsibility of the plant physician until workers return for employment when item No. 2 again becomes effective.

(4) All cases are reported to the health department, preferably by the family doctor, or by the plant doctor, according to the wishes of the former.

With the effectuation of the above program, the responsibility of industry stops. It is, therefore, necessary that the community be organized to supplement the case-finding function of the plant physician by conventional investigation of contacts, treatment and rehabilitation of all cases discovered by him. As a matter of fact, this is being very generally done, except that possibly the full importance of industry as a case finding agency is not generally appreciated. It is, therefore, suggested that in setting up their tuberculosis control programs, health officers do not overlook the industrial resources for coöperation.

1. c. *The Syphilis Control Program* does not differ in its essential elements from the tuberculosis program. Of course, the communications are always private and there is no need to deprive a syphilitic of employment unless he is in a communicable stage of the disease.

As in tuberculosis, industry cannot be expected to go farther than case finding. Treatment is a responsibility of the general profession, and its extent and duration must rest in the judgment of the attending physicians. Leadership in developing the program is no doubt a function of the official health agencies.

1. d. *The Diabetes Control Program* also does not differ essentially from the tuberculosis program, except that the administration of insulin in some form is a life-time necessity and the real problem is to see that the patient continues his treatments. Coöperation between the plant physician and the family doctor is very necessary.

Under the heading, *Early Diagnosis Campaigns*, are listed those diseases, or conditions, which can be treated most advantageously if discovered early.

2. a. *Appendicitis* is a good example. This is the procedure:

(1) Employees are instructed to report to the plant doctor when suffering with pain in the abdomen, especially if the pain comes on suddenly while at work.

(2) Foremen are requested to coöperate in sending such employees to the medical department.

(3) The doctor checks the workman's medical record for history of previous attacks, examines the workman, and makes blood counts.

(4) If he finds evidence of an acute appendix, he informs the workman and in his presence telephones the family doctor, explains the condition he finds, and disposes of the patient according to instructions of the family doctor. Usually the patient is sent directly to a hospital where he is met by his own doctor.

The result of this procedure is usually early operation and early return to work.

All of the other conditions listed under early diagnosis campaigns are handled in much the same fashion, with slight variations according to circumstances. The essential feature in all of them is that the patient is put into contact with his regular doctor as soon as diagnosis is made, and that doctor is expected to carry on from that point.

With respect to *pregnancy* (2. e.) the advantages of early contact with the physician are obvious, and from the public health standpoint, it can be readily seen that here are additional opportunities for prenatal nursing supervision.

The advantages of early recognition of the communicable diseases are so evident from the public health standpoint as to require no discussion.

3. *The Routine Case Finding Procedures* are, in reality, periodic health examinations of all workers. Their primary object is the continued safe employment of the workers, but in its accomplishment, a great variety of physical defects and chronic diseases are found. As the examinations are made with a considerable degree of regularity, these conditions are usually found in fairly early stages of their development.

Employees who require treatment are promptly encouraged to consult their own physicians, and if their capacity for work is partially impaired, or if the effect of employment is possibly harmful to them, they are suitably employed under special medical supervision.

The benefits of the above in relation to their possible effects upon the public health are readily apparent, and the procedure seems to be a function that should be encouraged by the official health agencies. As a matter of fact, the modern type of industrial physician regards himself as the health officer of the group he serves. His approaches, his thinking, and his results are more or less in line with public health, yet it is only recently that he has awakened to that fact, and frankly, I do not believe that the official health group, generally speaking, is yet aware of it.

PUBLIC HEALTH AND INDUSTRY

Public health has an ally in industrial medicine. The question is how best to utilize it? The answer is through industrial hygiene bureaus or units which can render valuable services to industry. The services such a bureau can furnish are excellently outlined by H. G. Dyktor, Chief Industrial Hygiene Engineer of the Michigan Health Department, in a personal communication, as follows:

1. Make special tests, examinations, and studies which the plant medical department is not equipped or qualified to perform.
2. Provide detailed and specific information on toxic substances and harmful conditions.
3. Provide comparable statistics on other plants in the same industry or with similar problems.
4. Furnish industrial health statistics duly interpreted.
5. Correlate work of industrial hygiene in many plants to obtain uniformity.
6. Work with and through the plant medical department to obtain specific improvements, better housekeeping, and sanitation, etc.
7. Stimulate the plant medical department to concentrate on preventive measures.
8. Stimulate the plant medical department to interest itself in the worker's life beyond the confines of the plant.

In return for the foregoing, Mr. Dyktor says the following may be expected from the plant medical department:

1. The sincere desire to improve the health of the workers—altruistic but indispensable.
2. Support the industrial hygiene unit in its educational campaign to make both employers and employees as health-conscious as they are accident-conscious.
3. Supply the industrial hygiene unit with records of absenteeism, due to both sickness and accidents, for analytical examination.
4. Advise the industrial hygiene unit of its own experiences in preventive and control measures so that they may be useful to other plants.
5. Support the industrial hygiene unit in obtaining recommended improvements once they have been decided upon.
6. Coöperate with the industrial hygiene unit on the greater concept of industrial hygiene, *i.e.*, non-occupational diseases, housing, etc.

In closing, I wish again to quote from Mr. Dyktor, who says, ". . . through the industrial hygiene unit the entire force of the local health agency can be placed at the disposal of the plant medical department and thereby make a full health program possible."

I would add this corollary—that through the industrial hygiene unit, the

vast resources of industrial medicine can be made available to public health and the medical profession by the promotion and development of disease control programs in industry, early diagnosis campaigns, and periodic health examinations.

Thus, in short, the industrial physicians can be made, in reality, to be deputy health officers on the one hand and case finding agencies for the medical profession on the other, the objective being the maintenance of the health of the workers.

Health Council Functions

"The purposes of the (local) Health Council are primarily to promote the coördination of public and private health work and to aid in securing continuity of program; to serve as a forum for discussion of health and sickness problems, policies, and plans; to develop new standards of service and to improve present standards through joint study of special problems; to secure improvement in existing health facilities and services and the establishment of new or additional health facilities or services where needed; to prevent duplication of effort; and to give moral support to the existing department of health, in coöperation with the medical and dental societies. A health council functions by developing better understanding among the official and private health agencies of a city."
—Professor Ira V. Hiscock, "Some Opportunities and Progress for the National Health Council."

Alkyl-Dimethyl-Benzyl-Ammonium-Chloride for Sanitization of Eating and Drinking Utensils*

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PUBLIC health authorities are more concerned than ever before regarding the spread of infection by direct contact, particularly as related to eating and drinking utensils in public places. That such utensils improperly washed and sanitized are carriers of bacteria and may be directly responsible for the transmission of disease is established.

Cumming and Lynch [1] in 1919, and Cumming later with other associates [2] demonstrated that influenza and salivaborne disease may be transmitted by indirect contact through the medium of eating utensils. Mallmann [3] studied various types of detergents and disinfectants and concluded that chemical disinfection should be avoided where hot water is available. This conclusion was based upon the fact that chlorine compounds commonly used, may be bypassed by restaurant attendants to avoid odor on the glasses. Cumming and Yongue [4] in 1936, suggested further investigation into the application of chlorine to dish and utensil washing, stating that lack of extended tests left much to be proved regarding the practicability of this chemical.

Krog and Dougherty [5] drew attention to the high bacterial count of tumblers and wash and rinse waters in public places. They concluded that conventional washing methods act only as detergents and do not have appreciable bactericidal value. Public health measures are now more widely enforced, making compulsory some form of sanitization which has effected cleaner and less contaminated utensils. All of the methods advocated, from steam sterilization to chemical disinfection, however, have innumerable drawbacks, making present procedures far from ideal.

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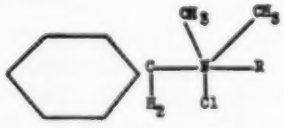
* Alkyl-dimethyl-benzyl-ammonium-chloride supplied by Alba Pharmaceutical Company under the trade name of "Zephiran Industrial," brand of benzyl-trialkonium-chloride.

. . . This organic compound, a metal-free solid of amber color and of soap-like consistency, is readily soluble in water. It has the following formula in which *R* represents a mixture of alkyl radicals (between C_8H_{17} and $C_{18}H_{37}$) derived from the fatty acids of coconut oil:



Antiseptic and Germicidal Properties of a Mixture of High Molecular Alkyl-dimethyl-benzyl-ammonium Chlorides, by Cecil G. Dunn, *Am. J. Hyg.*, July, 1937, p. 46.

The physical characteristics of a new chemical consisting of a series of alkyl-dimethyl - benzyl - ammonium-chlorides for disinfection and detergent purposes as reported by Domagk,[6] Dunn,[7] Heineman,[8] Walter,[9] and others, prompted us to investigate its use for sanitizing eating and drinking utensils in public establishments.

The writers have endeavored to determine the bactericidal efficiency and the practical utility, under various conditions, found in commercial application of alkyl - dimethyl - benzyl-ammonium-chloride.

EXPERIMENTAL

Laboratory investigations of alkyl-dimethyl - benzyl - ammonium - chloride were carried out as follows:

Glass tumblers, which on the basis of cleanliness and bacterial counts are generally accepted indices of dishwashing efficiency, were artificially contaminated with various suspensions in lactose broth of bacteria obtained from human feces and used as factors for observing bactericidal values. Heavy bacterial suspensions in sour cream were also used in order to determine whether or not fats were inhibitive to the bactericidal action of the sanitizing solution.

A cotton swab was used to smear the contaminant over the inner and outer areas of the tumbler that normally come in contact with the users' lips. The tumblers were allowed to dry for 5 minutes at room temperature, then immersed in alkyl-dimethyl-benzyl-ammonium-chloride solutions of various concentrations for different time and temperature intervals. At the end of each exposure, the tumblers were removed with sterile forceps to prevent accidental contamination, and swabbed after the technic described by Krog and Dougherty. The swabs were then placed in sterile test tubes containing 10 cc. 1/N saline solution, vigorously shaken in a Kahn machine for 3 minutes, and plated in the usual manner.

Immediately after being used for treating each series of tumblers, portions of the sanitizing solution, undi-

TABLE 1

Laboratory Tests

The Bactericidal Action of Alkyl-dimethyl-benzyl-ammonium-chloride at Indicated Concentrations and Time Intervals Using Nutrient Agar Lactose Broth Inoculated with Feces as the Contaminant

(a) Chemical Concen.	Exposure Time	Av. Bac. Temp.	Av. Bac. Count	Av. Bac. Control	(b) Sanitizing Sol'n.	Av. Bac. Temp.	Av. Bac. Count	Av. Bac. Control	(b) Sanitizing Sol'n.	Av. Bac. Temp.	Av. Bac. Count	Av. Bac. Control	(b) Sanitizing Sol'n.
1- 2,500	1 min.	54° F.	10	172,000	0	86° F.	0	230,400	0	116° F.	185	115,000	0
	2 "	"	10	234,000	0	"	25	"	0	"	5	"	0
	3 "	"	20	"	0	"	25	"	0	"	0	"	0
1- 5,000	1 "	"	230	144,000	0	"	25	"	0	"	0	110,000	0
	2 "	"	25	115,000	0	"	25	"	0	"	0	111,000	0
	3 "	"	70	"	0	"	40	"	0	"	0	110,000	0
1- 7,500	1 "	"	200	"	0	"	75	"	0	"	0	115,000	0
	2 "	"	140	"	0		(c)			"	10	110,000	0
	3 "		(c)			"	45	"	0	"	10	"	0
1-10,000	1 "	"	950	99,000	0	"	75	"	0	"	20	25,800	0
	2 "		(c)				40	"	0	"	5	"	0
	3 "	"	475	111,000	0	"	15	"	0	"	20	"	0
1-12,500	1 "	"	300	80,000	0	"	195	"	0	"	75	"	0
	2 "	"	275	84,000	0	"	20	"	0	"	25	"	0
	3 "	"	275	80,000	0	"	95	"	0	"	15	"	0
1-15,000	1 "	106° F.	100	46,080	0								
	2 "	"	40	"	0								
	3 "	"	65	"	0								

(a) Alkyl-dimethyl-benzyl-ammonium-chloride
(b) Alkyl-dimethyl-benzyl-ammonium-chloride solution
(c) Accidentally contaminated

TABLE 2

Laboratory Tests

The Bactericidal Action of Alkyl-dimethyl-benzyl-ammonium-chloride at Various Concentrations in the Presence of Several Detergents Commonly Found in Dish Washing Procedures, Using Lactose Broth Inoculated with Feces as the Contaminant

(a) Chemical Concen.	Exposure Time	Temp.	Av. Bac. Count	Control	(b) Sanitizing Sol'n.	Temp.	Av. Bac. Count	Control	(b) Sanitizing Sol'n.
Trisodium Phosphate at a Concentration of ¼ Oz. per Gallon of Sanitizing Solution									
1- 5,000	1 min.	82° F.	5	149,760	0	84° F.	40	32,000	0
	2 "	"	25	"	0	"	5	"	0
	3 "	"	65	"	0	"	15	"	0
1- 7,500	1 "	"	20	"	0	"	45	"	0
	2 "	"	10	"	0	"	0	"	0
	3 "	"	50	"	0	"	0	"	0
1-10,000	1 "	"	10	"	0	"	5	"	0
	2 "	"	5	"	0	"	15	"	0
	3 "	"	0	"	0	"	80	"	0
1-12,500	1 "	"	20	"	0	"	15	"	0
	2 "	"	0	"	0	"	15	"	0
	3 "	"	0	"	0	"	100	"	0
Hexa Meta Phosphate at a Concentration of ¼ Oz. per Gallon of Sanitizing Solution									
1- 2,500	1 min.	84° F.	5	46,080	0				
	2 "	"	15	"	0				
	3 "	"	10	"	0				
1- 5,000	1 "	"	65	40,000	0	82° F.	5	46,080	
	2 "	"	30	"	0	"	0	"	
	3 "	"	20	"	0	"	5	"	
1- 7,500	1 "	"	10	"	0				
	2 "	"	10	"	0				
	3 "	"	0	"	0				
Soap Powder at a Concentration of ¼ Oz. per Gallon of Sanitizing Solution									
1- 2,500	1 min.	82° F.	10	3,000	0	84° F.	5	5,120	
	2 "	"	15	"	0	"	0	"	
	3 "	"	5	"	0	"	0	"	
1- 5,000	1 "	82° F.	4,800	6,400	5	"	5	"	
	2 "	"	35		5	"	5	"	
	3 "	"	5		5	"	20	"	
1- 7,500	1 "	"	35		5	"	15	5,760	
	2 "	"	10		5	"	10	"	
	3 "	"	(c)		5	"	10	"	
Soap Sol'n only—¼ oz./gal.	1 "	89°F.	34,560	46,080	37				
	2 "	"	25,920	"	37				
	3 "	"	17,280	"	37				

(a) Alkyl-dimethyl-benzyl-ammonium-chloride
(b) Alkyl-dimethyl-benzyl-ammonium-chloride solution
(c) Accidentally contaminated

luted and in dilutions of 1–10 and 1–100 respectively, were planted on agar and in lactose broth fermentation tubes to determine bacteria load. In all instances, control tumblers were smeared with the same contaminants as used to determine the bactericidal values of the sanitizing solution, then swabbed without exposure to the chemical. Initial bacteria counts were also made of the various contaminants to assure prolific growth before use.

Keeping in mind actual conditions existent in food and beverage establishments, we examined the bactericidal action of this chemical in the presence of various detergents that would normally gain access to the sanitizing solution by carry-over from the wash water. The three detergents, trisodium phosphate, hexa-meta-phosphate, and soap (powdered), in the concentrations studied, do not appreciably affect the potency of alkyl-dimethyl-benzyl-ammonium-chloride as will be observed in Table 2.

To determine the action of alkyl-dimethyl-benzyl-ammonium-chloride in the presence of butter fat (Table 3) and lipstick (Table 4) deposited upon tumblers, two types of experiments were performed. In the case of butter fat, heavy sour cream inoculated with feces was smeared on tumbler rims under the same conditions as described. Table 3 indicates that the sanitizing solution at tap water temperature (54° F.) was ineffective, but when the temperature was increased to 114°F., the efficiency was increased to a remarkable degree.

Two types of lipstick were used, one having a heavy, waxy base with a high pigment load, the other having a light creamy base containing dye. Various individuals applied the stick to the lips, smeared saliva over the entire waxed lip with the tongue and contaminated sterile tumblers by pressing the lips against the rim in the manner of drinking. Of the tumblers contaminated, one was used as a control; the others were immersed in a solution of alkyl-dimethyl-benzyl-ammonium-chloride 1:5,000 for 1 minute at 74°F. Table 4 shows that the heavy, waxy lipstick evidently protected any organisms present inasmuch as the controls also were negative. The other lipstick, however, showed

TABLE 3

Laboratory Tests

The Bactericidal Action of Alkyl-dimethyl-benzyl-ammonium-chloride at Various Concentrations and Time Intervals Using Heavy Cream Inoculated with Feces as the Contaminant

(a) Chemical Concen.	*Exposure Time*	*Temp.*	*Av. Bac. Count*	*Control*	*(b) Sanitizing Sol'n.*	*Temp.*	*Av. Bac. Count*	*Control*	*(b) Sanitizing Sol'n.*
1– 2,500	1 min.	56° F.	5	370	0				
	2 "	"	5	"	0				
	3 "	"	15	"	0				
1– 5,000	1 "	"	5	320	0	114° F.	0	86,400	0
	2 "	"	0	"	0	"	15	"	0
	3 "	"	0	"	0	"	20	"	0
1– 7,500	1 "	"	5	"	0	"	0	"	0
	2 "	"	0	"	0	"	20	"	0
	3 "	"	0	"	0	"	10	"	0
1–10,000	1 "					"	175	"	1
	2 "					"	10	"	1
	3 "					"	10	"	1

TABLE 4

The Bactericidal Action of Alkyl-dimethyl-benzyl-ammonium-chloride on Organisms Associated with Lipstick Deposits upon Tumblers

Chemical Concen.	*Exposure Time*	*Temp.*	*Average Bac. Count per Rim Waxy Stick*	*Control*	*Average Bac. Count per Rim Indelible Stick*	*Control*
1–5,000	1 min.	79° F.	10	0	0	850
"	"	"	10	0	0	850
"	"	"	30	0	20	850
"	"	"	100	3,760	100	960
"	"	"	125	5,760	80	960
"	"	"	(c)			
"	"	"	40	470	80	960
"	"	"	65	470		
"	"	"	85	470		

(a) Alkyl-dimethyl-benzyl-ammonium-chloride
(b) Alkyl-dimethyl-benzyl-ammonium-chloride solution
(c) Accidentally contaminated

TABLE 5

Field Tests

Bacteria Counts of Tumblers Washed in Hot Soapy Water and Sanitized in a 1–5,000 Solution of Alkyl-dimethyl-benzyl-ammonium-chloride

Establishment	*Bacteria per cc. Wash Water*	*Exposure Time*	*Av. Bacteria per Tumbler 2 Tumblers Examined*	*Sanitizing Sol'n Bacteria per cc.*
No. 10 Restaurant	5,120	1 min.	60	1
	"	2 "	15	1
	"	3 "	40	1
	"	1 "	40	3
	"	2 "	20	3
	"	3 "	5	3
	2,240	1 "	40	0
	"	2 "	40	0
	"	3 "	30	0
	1,890	1 "	35	3
	"	2 "	40	3
	"	3 "	25	3
	10,240	1 "	15	3
	"	2 "	20	3
	"	3 "	10 — 1 plate	3
	"	1 "	25	1
	"	2 "	30	1
	"	3 "	40	1
Establishment				
No. 11 Restaurant	5,760	1 "	45	0
	"	2 "	10	0
	"	3 "	45	0
	7,424	1 "	90	1
	"	2 "	75	1
	"	3 "	80	1
	8,640	1 "	30	2
	"	2 "	15	2
	"	3 "	20	2
	7,500	1 "	20	1
	"	2 "	20	1
	"	3 "	15	1
	3,840	1 "	25	2
	"	2 "	30	2
	"	3 "	30	2
	"	1 "	40	0
	"	2 "	30	0
	"	3 "	30	0

substantial bacterial counts whereas the treated tumblers showed a comparatively negligible growth.

Having established that a solution of alkyl-dimethyl-benzyl-ammonium-chloride 1:5,000, sanitized utensils to a remarkable degree in the laboratory under the most rigid conditions, this agent was then subjected to tests in the field to note its practical value. The chemical was used in the final rinsing compartment in taverns and restaurants at the concentration noted.

FIELD

The coöperation of two restaurants and two taverns was solicited to establish the practicability of this product when used as a final rinse in the washing procedure. One part alkyl-dimethyl-benzyl-ammonium-chloride to 5,000 parts of cold water was found to be the most practical dilution for this purpose. It will be noted in Table 1 that alkyl-dimethyl-benzyl-ammonium-chloride is bactericidal up to 1–15,000. However, in order to minimize the possibility of reduction in bactericidal efficiency due to dilution and accumulation of organic matter carried over on utensils, and to establish a minimum exposure interval, the higher concentration was decided upon as best for use under commercial conditions. Samples of the wash water and rinse water (sanitizing solution) were plated in each test. The swabbing

TABLE 6

Field Tests

Bacteria Counts of Tumblers Rinsed in Cold Clear Water and Sanitized in a 1–5,000 Solution of Alkyl-dimethyl-benzyl-ammonium-chloride

Establishment	*Bacteria per cc. Wash Water*	*Exposure Time*	*Av. Bacteria per Tumbler 2 Tumblers Examined*	*Sanitizing Sol'n Bacteria per cc.*
No. 13 Tavern	56	1 min.	0	0
	"	2 "	25	0
	"	3 "	10	0
	640	1 "	0	1
	"	2 "	15	1
	"	3 "	10	1
	2,560	1 "	25	0
	"	2 "	20	0
	"	3 "	20	0
	"	1 "	65	5
	"	2 "	25	5
	"	3 "	20	5
Establishment				
No. 20 Tavern		1 min.	180	0
		2 "	(c)	0
	No Wash	3 "	20	0
	Water	1 "	(c)	4
	Used	2 "	110	4
		3 "	95	4
		1 "	15	3
		2 "	20	3
		3 "	5	3
		1 "	10	2
		2 "	15	2
		3 "	180	2
		1 "	100	0
		2 "	60	0
		3 "	35	0
		1 "	30	0
		2 "	30	0
		3 "	20	0

(c) Accidentally contaminated

technic employed was as described by Krog. The rinse solution was prepared at the start of every test so that control of initial concentration could be assured.

In the restaurants, two-compartment metal sinks were used in washing. One contained hot, soapy water at the usual restaurant dish-washing temperature of approximately 110°F., the other, alkyl-dimethyl-benzyl-ammonium-chloride 1: 5,000 solution in which the tumblers were immersed for various times.

Dish-washing was continued with no change in the routine technic. At unappointed intervals, over several weeks, tumblers were taken from the rinse solution, the time of exposure accurately noted and cultured by the conventional rim test method (See Table 5).

At the taverns where utensils are not generally washed but merely rinsed after each use, the tumblers were placed in the sanitizing solution immediately after being subjected to the usual barkeepers' rinse. The tumblers in one tavern, designated in Table 6 as No. 20, were submerged for various time intervals in alkyl-dimethyl-benzyl-ammonium-chloride solution without preliminary cold water rinse. This procedure at No. 20 is evidently the cause for a few counts in excess of 100 colonies.

It will be noted in Tables 5, 6, and 7 that the bacteria count per cc. of sanitizing solution is negligible after prolonged use under commercial conditions.

On the basis of the data collected

TABLE 7

Field Tests

Stability Time Study and Bacteriological Examination Results of Alkyl-dimethyl-benzyl-ammonium-chloride Sanitizing Solutions in Use at Several Eating and Drinking Establishments

Establishment	Initial Concen.	Concentration of Alkyl-dimethyl-benzyl-ammonium-chloride in Sanitizing Solution After:				
		1 Hour	2 Hours	3 Hours	4 Hours	5 Hours
No. 10 Restaurant	1–5,000	1–5,000	1–7,500	1–10,000	1–10,000	
21 "	1–5,000	1–5,000	1–5,000	1– 5,000	1– 7,500	
13 Tavern	1–5,000	1–5,000	1–5,000	1– 5,000	1– 5,000	1–6,000
20 "	1–5,000	1–5,000	1–7,500	1– 7,500	1– 7,500	1–7,500

Establishment	Bacteria Count per cc. of Sanitizing Solution After Being Used:				
	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours
No. 10 Restaurant	0	0	0	0	0
21 "	0	0	0	0	0
13 Tavern	0	0	0	0	0
20 "	0	0	0	0	0

during the field investigation, it appears that alkyl-dimethyl-benzyl-ammonium-chloride is a satisfactory sanitization agent for public eating and drinking utensils since a utensil with a bacterial count of less than 100 colonies per tumbler rim is generally accepted as properly sanitized.

STABILITY

The stability of alkyl-dimethyl-benzyl-ammonium-chloride was also observed in the laboratory and field, as this is of great importance. The laboratory tests demonstrated that none of the chemical was dissipated during the investigation. Since a limited number of contaminated tumblers passed through any given solution in the laboratory, this particular study is of no value in the determination of stability. However, the field investigation showed that the chemical is very stable over long periods of time and under heavy usage, another favorable characteristic for the practical sanitization of eating and drinking utensils.

To determine the presence and concentration of alkyl-dimethyl-benzyl-ammonium-chloride in the rinse solution, a colorimetric test was employed, based upon the fact that the chemical combines with various acidic dyes to form colored compounds. These colored compounds are extractable from alkaline solution by ethylene dichloride. The test is simple and specific, since soap, ammonia, ethanolamines, sodium phosphates, and temperature do not interfere. Place in a test tube (standard colorimetric) 1 cc. of the solution to be tested. Add 5 cc. of N/1 NaOH and 5 cc. of ethylene dichloride. Close tube with rubber stopper and shake well. Add 1 cc. 0.04 per cent brom-thymol blue (Clark's indicator) and shake well again. In the absence of alkyl-dimethyl-benzyl-ammonium-chloride, the lower phase (ethylene dichloride) will be colorless. If the chemical is present, the lower phase will be colored blue, the depth of the color being proportional to the quantity of the chemical present. The La Motte Chemical Products Company has developed standard color comparator tubes which may be satisfactorily used in this colorimetric determination. The test may be made quantitative by adding the brom-thymol blue solution, two drops at a time and shaking after each addition. In this method, the blue color will be taken out of the aqueous layer by the organic solvent layer until all the chemical present has combined with the indicator. After this point has been reached, the aqueous layer will retain the added blue color. This makes for a definite end-

point, easily observed. Each cc. of 0.04 per cent brom-thymol blue corresponds to 0.47 mg. alkyl-dimethyl-benzyl-ammonium-chloride.

SUMMARY AND CONCLUSIONS

1. A 1:5,000 solution of alkyl-dimethyl-benzyl-ammonium-chloride demonstrates marked bactericidal action against bacteria found on eating and drinking utensils.

2. Detergents and soaps have little or no effect on the potency of this compound in two or three compartment washing procedures.

3. Stability of the chemical is favorable to the application studied herein. Concentrations can be easily checked colorimetrically in the field by inspectors.

4. Temperature does not affect the stability or bactericidal efficiency adversely above the temperature of 70° F.

5. A 1 minute exposure is apparently sufficient to reduce surviving bacteria to below 100 colonies per tumbler rim.

METHOD

From the foregoing, a satisfactory method for sanitizing dishes by hand in restaurants and soda fountains follows:

1. Wash off organic debris with running water.

2. Wash dishes by hand in hot water (120° F.) containing soap or other detergent.

3. Place dishes in alkyl-dimethyl-benzyl-ammonium-chloride rinse water for at least 1 minute.

4. Remove and air dry.

No after rinse is required as alkyl-dimethyl-benzyl-ammonium-chloride is odorless, tasteless and non-toxic in the concentrations used.

In taverns where glasses are not washed in soap and hot water after each individual use, the following procedure is recommended:

Cold water rinse followed by 1 minute immersion in alkyl-dimethyl-benzyl-ammonium-chloride at a 1–5,000 concentration.

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Prevalence of Pneumococcus Carriers: Specific Types in Epidemic and Non-Epidemic Areas*

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THE pneumonias have generally been considered endemic, rather than epidemic diseases, although references to epidemics of pneumonia may be found even in the early medical literature.[1, 2] In recent years, epidemics of pneumonia due to specific types of pneumococci have been observed with increasing frequency, and certain types have been shown to be more frequently associated with epidemic pneumonia than others. A number of institutional outbreaks of pneumonia due to Type I [3] and Type II [4, 5] have been reported. Community outbreaks in which Type I infection predominated have been observed by Sydenstricker and Sutton [6] in Maryland in 1917; more recently in Germany by Gundel [7]; and by Gilman and Anderson in Massachusetts.[8] An explosive epidemic of colds, bronchitis, and pneumonia in a child-caring institution was reported by Schroder and Cooper [9] in 1930, in which Type V pneumococcus infection apparently predominated.

As a result of the emphasis placed upon early typing and specific serum treatment in pneumonia as a part of the control program in New York State during recent years, there has been a marked increase in the proportion of cases typed, and the number of types for which sputum specimens have been tested has increased in most laboratories. During 1938, all approved laboratories in the state have been supplied with diagnostic sera for at least Types I, II, V, VII, and VIII.

Table 1 shows comparative prevalence of pneumonia of the common types during 1938 in certain counties in the state, in which typing was reasonably complete, and in which laboratory facilities were adequate. In almost all counties Type I infection predominated. There was considerable variation in the proportion of typed cases found to be due to Type V. The counties listed in Table 1 are roughly in geographical order, from the western to the eastern part of the state, and the two counties in which over 20 per cent of the typed cases were Type V are adjacent and located at approximately the geographical center of the state. The concentration of Type V pneumonia in this central area was quite marked during 1938.

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TABLE 1

Pneumonia and Pneumococcus Type Incidence in Certain Counties
New York State—1938

County	Total Reported Cases of Pneumonia	Cases Typed: Number	Cases Typed: Per cent	Incidence of Certain Types: I Number	I Per cent Typed Cases	II Number	II Per cent Typed Cases	V Number	V Per cent Typed Cases	VII Number	VII Per cent Typed Cases	VIII Number	VIII Per cent Typed Cases
Cattaraugus	197	77	39.1	14	18.2	4	5.2	6	7.8	2	2.6	4	5.2
Livingston	175	54	30.8	12	22.2	..	...	1	1.8	9	16.7	2	3.7
Steuben	360	172	47.8	46	26.7	8	4.6	19	11.0	12	7.0	12	7.0
Onondaga *	327	171	52.3	32	18.7	3	1.8	35	20.5	11	6.4	8	4.7
Madison	154	75	48.7	7	9.3	2	2.7	22	29.3	2	2.7	2	2.7
Otsego	189	117	61.9	30	25.6	3	2.6	8	6.8	9	7.7	6	5.1
Fulton	124	50	40.3	10	20.0	7	14.0	7	14.0	2	4.0	5	10.0
St. Lawrence	247	108	43.7	32	29.6	5	4.6	8	7.4	12	11.1	7	6.5
Essex	84	36	42.8	14	38.9	..	...	2	5.6	5	13.9	5	13.9
Broome	785	416	53.0	101	24.3	6	1.4	5	1.2	34	8.2	17	4.1
Greene	104	51	49.0	10	19.6	1	2.0	4	7.8	4	7.8	2	3.9
Westchester	1,583	496	31.3	137	27.6	28	5.6	19	3.8	28	5.6	36	7.2

* Exclusive of Syracuse

Type I pneumococci have been most frequently encountered in cases of pneumonia in the state as a whole; Type II pneumococci have been found in a relatively small proportion of the typed cases; Type V pneumococci have been encountered with greater relative frequency in New York State than in most series of cases reported. There has been considerable variation in the prevalence of these types in different areas, and in many instances this has apparently been due to localized epidemics of a homologous type.

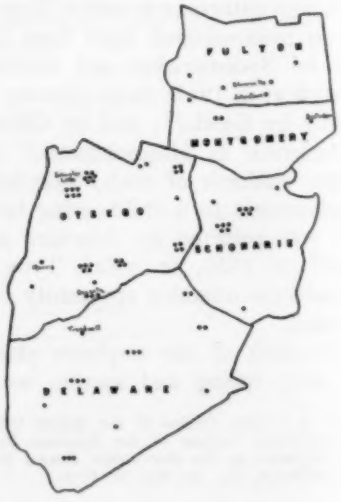
The spot maps show the grouping of cases of pneumonia according to type in an area in which detailed observations were made. Maps I, II, and III show the distribution of Types I, II, and V pneumonia respectively in 5 counties included in two state health districts. The localization by types is apparent. Epidemic areas are evident, especially for Type II and Type V. This localization is not correlated with density of population.

In view of the definite grouping of certain types of pneumococcus pneumonia, it has been considered desirable to make detailed epidemiological and bacteriological studies in areas in which epidemics occur. An epidemiological unit was organized, including a portable field laboratory, and put into service in January, 1939.

Field studies were carried out in the following three isolated communities in New York State. The first survey

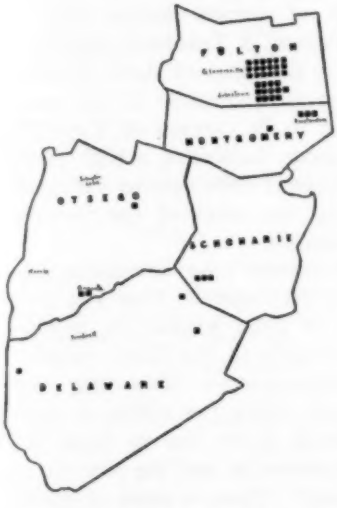
MAP I

DISTRIBUTION OF TYPE I PNEUMOCOCCUS PNEUMONIA
JULY 1938 – JULY 1939



MAP II

DISTRIBUTION OF TYPE II PNEUMOCOCCUS PNEUMONIA
JULY 1938 – JULY 1939



MAP III

DISTRIBUTION OF TYPE V PNEUMOCOCCUS PNEUMONIA
JULY 1938 – JULY 1939

was made in Treadwell, with a population of 280, located in Delaware County midway between the west branch of the Delaware and the Susquehanna Rivers, approximately 60 miles northeast of Binghamton, and 15 miles east of Oneonta. It is located in the hills where travel in the winter is difficult.

Morris, having a population of approximately 400, is located about 30 miles west of Treadwell. It is 15 miles northwest of Oneonta.

Cannonsville, a village of 320 population, is located on the west branch of the Delaware River, 30 miles southwest of Treadwell. There were no industries in operation in any of the three villages and none was located on a main highway or on a railroad.

Cultural surveys were carried out in each of the study areas. Nasal cultures were obtained by passing a sterile swab through each nostril into the nasopharynx. A second swab was used for obtaining the throat culture, and special care was observed to swab as much of the oral pharynx as possible, including the tonsils, and especially the crypts of the tonsils if present. Both swabs were inoculated directly into Avery's blood broth. During the early part of the first study, separate broth tubes were used for the nose and throat.

Cultures were transported to the field laboratory for incubation, with a delay of not more than 2 to 5 hours. After incubation for 6 hours, all cultures were tested for pneumococci by the Neufeld method and by mouse inoculation. All identifications were confirmed either by the Otsego County Laboratory or by the Division of Laboratories and Research of the State Department of Health.

In Treadwell, the field laboratory completed the identification of Type I pneumococci, and in Morris of Type V. In Cannonville the field laboratory completed the identification of both Type I and Type V pneumococci. All other strains isolated were identified in the Division of Laboratories and Research or in the Otsego County Laboratory.

TREADWELL STUDY

In December, 1938, Dr. George M. Mackenzie of Cooperstown had undertaken a study in the isolated village of Schuyler Lake in the northwest corner of Otsego County, where an epidemic prevalence of Type I pneumococcus pneumonia was occurring. A preliminary carrier survey made by him showed a high prevalence of carriers of Type I pneumococci among the residents. In order to compare the prevalence of carriers of various types of pneumococci in isolated villages, it seemed desirable to undertake a carrier survey in a village in which no pneumonia had occurred for a considerable time. Treadwell was selected because no known cases of pneumonia had occurred during the preceding 8 months, and no known Types I, II, and V pneumonia had occurred in the village for at least 2 years. Any contact between residents of Schuyler Lake and Treadwell seemed unlikely because of their wide separation.

A survey in this area was started January 23, 1939, and completed March 21, and while no unusual prevalence of respiratory infection had been noted, preliminary tabulation of the first bacteriological findings revealed the startling fact that approximately 25 per cent of the individuals cultured were carriers of Type I pneumococcus.

In the course of the study, it was learned that on January 31 a resident of Treadwell had become ill and was removed to a hospital in a village approximately 12 miles distant. Inquiries made it clear that this patient had suffered from lobar pneumonia, but unfortunately his sputum was not typed, nor was blood culture taken. Nasal and throat cultures obtained from the patient approximately 3 weeks after onset contained Type I pneumococci. Repeated culturing showed him to be a persistent carrier of Type I and mouse protection tests showed that his serum contained antibodies specific for Type I in high titer. It seems reasonable to assume, therefore, that this patient, who became ill January 31, suffered from Type I pneumococcus pneumonia. It is of special interest that of 34 individuals in Treadwell cultured previous to the onset of illness in this case, 11, or approximately 30 per cent, were found to be carriers of Type I pneumococcus, indicating a high prevalence of Type I infection in the area preceding the onset of the first case of pneumonia.

A second case of pneumonia had onset February 5; this was a typical case of lobar pneumonia, and sputum typed early in the illness showed Type I pneumococcus. Two other cases occurred during the spring of 1939, one believed to be due to Type XXVIII pneumococcus, and the other to "streptococci." These 4 cases of pneumonia, in two of which Type I was believed to have been the etiological agent, occurred during 3½ months. While this represents an attack rate in excess of that prevailing in Otsego County or similar areas, it would not generally have been regarded as constituting an epidemic. The care with which the survey was made would seem to justify the conclusion that there were no other cases.

Cultures were obtained from 191 persons residing in the village, and Type I pneumococcus was definitely the predominant type encountered in Treadwell. As shown in Table 2, 32, or 17 per cent, of the 191 individuals cultured were found to be carriers of this microörganism. Twelve of the individuals cultured were household contacts of the 2 cases of Type I pneumococcus pneumonia and of these, 5 were found to be carriers of Type I pneumococcus. Seventeen different types were isolated, as shown in Table 3. Other than Type I, Types XV and XXIX were the most frequently encountered. Twenty-two per cent of those cultured were carriers

TABLE 2

Results of Nose and Throat Cultures among Persons Cultured, Exclusive of Cases, in Treadwell, N. Y., January 23 to March 21, 1939

	Number of Persons			Per cent of Total		
Results of Culture	Under 20 Years	20 Years and Over	Total	Under 20 Years	20 Years and Over	Total
Type I pneumococcus	22	10	32	33.8	7.9	16.7
All other types	22	20	42	33.8	15.9	22.0
Total positive	44	30	74	67.7	23.8	38.7
Total negative	21	96	117	32.3	76.2	61.3
Individuals cultured *	65	126	191	100.0	100.0	100.0

* There were 8 multi-type individuals

TABLE 3

Prevalence of Carriers of Pneumococci in Treadwell, N. Y., as Shown by Survey, January 23 to March 21, 1939, According to Age and Type

	Number of Carriers		
Type of Pneumococcus	Under 20 Years	20 Years and Over	Total
I	22	10	32
XV	7	2	9
XXIX	2	5	7
VI	1	3	4
XIX	3	1	4
III	3	..	3
IV	2	1	3
XVII	..	2	2
XVIII	2	..	2
XXI	..	2	2
VIII	1	..	1
IX	..	1	1
XI	..	1	1
XIII	..	1	1
XIV	1	..	1
XX	1	..	1
XXVIII	..	1	1
XXXI	..	1	1
Not classified	4	2	6
Total positive	49	33	82

of types other than Type I. The prevalence of both the predominating type and all other types was higher in young persons.

MORRIS STUDY

During the study in Treadwell, it was noted that an unusual prevalence of Type V pneumococcus pneumonia was occurring in the village of Morris. Investigation revealed that 21 cases of pneumonia had occurred in this village or within a radius of 7 miles during the period November 24, 1938, to February 28, 1939. As shown in Table 4, of these 21 cases, sputum from 18 had been typed and in 14 Type V pneumococcus had been found. The population of the village and of the area included within the 7 mile radius in which the cases occurred was approximately 2,000. The occurrence of 14 cases of Type V pneumonia in this group obviously constituted an epidemic.

Epidemiological histories were obtained from 400 individuals, exclusive of cases, and of these, 272 were cultured between February 7 and March 21. The survey procedure in this area differed from that in either Treadwell or Cannonsville in that 3 different groups were cultured; first, family contacts of cases of Type V pneumonia; second, extra-familial contacts of these case families which were for the most part neighbors having frequent associa-

TABLE 4

Cases of Pneumonia, Morris, N. Y., and Vicinity

Winter of 1938–1939

Case	Age	Sex	Date of Onset	Type
R.S.	12	M	11/24	Not typed
D.V.	20	M	11/30	V
B.B.	6	F	12/1	Not typed
H.W.	47	M	12/13	V and VIII
J.D.	10	M	12/27	V
C.G.	37	M	1/15	V
D.P.J.	13	M	1/16	V
A.G.	64	M	1/17	XXIX
W.S.	56	M	1/19	V
L.R.	2	F	1/21	V
E.V.W.	74	F	1/24	Not typed
B.C.	5	F	1/26	V
C.J.	8	M	1/27	V
J.N.	6	M	1/29	XVII
V.H.	46	M	2/6	V
R.D.	47	M	2/7	V
M.E.F.	78	F	2/16	IX
C.P.	51	M	2/16	V
G.J.	34	F	2/24	V
W.C.	42	M	2/26	III
S.J.	59	F	2/28	V

TABLE 5

Prevalence of Carriers of Pneumococci in Morris, N. Y., and Vicinity as Shown by Survey, February 7 to March 21, 1939, According to Age and Type

Type of Pneumococcus	Number of Carriers: Under 20 Years	20 Years and Over	Total
III	4	7	11
V	9	2	11
VIII	3	4	7
XIX	5	2	7
VI	4	2	6
XXIX	3	2	5
XVII	4	..	4
XVI	1	2	3
XVIII	2	1	3
XI	2	..	2
XIV	2	..	2
XXIII	1	1	2
XXVII	2	..	2
I	1	..	1
VII	..	1	1
XV	1	..	1
XXII	1	..	1
XXVIII	1	..	1
Not classified	4	3	7
Total positive	50	27	77

tion with the case family, although direct contact with the case did not always occur; and third, a random sample of the population of the village. The sample of the population was obtained by taking cultures from alternate individuals named on the family rosters.

Type V and Type III predominated in this area and were of equal frequency. Eleven carriers of each of these types were found. In view of reported findings in carrier surveys, this number of carriers of Type III was not considered remarkable. Only one carrier of Type I pneumococcus and no carriers of Type II were encountered in the study. As shown in Table 5, 17 types other than Type V were isolated.

Table 6 shows the results of culturing according to predominating type (Type V) and other types isolated by age groups. It may be noted that the proportion of carriers of Type V, as well as of all other types, was higher in the younger age group. In the entire group cultured, only 4.4 per cent carried the predominating pneumococcus (Type V) whereas in Treadwell, 16.7 per cent were carriers of the predominating microörganism (Type I).

Table 7 shows the prevalence of

TABLE 6

Results of Nose and Throat Cultures Among Persons Cultured, Exclusive of Cases, in Morris, N. Y., and Vicinity, February 7 to March 21, 1939

Results of Culture	Number of Persons: Under 20 Years	20 Years and Over	Total	Per cent of Total: Under 20 Years	20 Years and Over	Total
Type V pneumococcus	9	2	11	9.1	1.3	4.4
All other types	38	24	62	38.4	15.8	24.7
Total positive	47	26	73	47.5	17.1	29.1
Total negative	52	126	178	52.5	82.9	70.9
Individuals cultured *	99	152	251	100.0	100.0	100.0

* There were 3 multi-type individuals, one of whom was positive for three types.

TABLE 7

Prevalence of Carriers of Type V Pneumococcus According to Age and Intimacy of Contact with Cases of Type V Pneumonia, Morris, N. Y., February 7 to March 21, 1939

Age	Number Cultured: Household Contacts	Extra Household Contacts	No Contact	Number Positive: Household Contacts	Extra Household Contacts	No Contact	Per cent Positive: Household Contacts	Extra Household Contacts	No Contact
0–19	33	13	53	7	..	2	21.2	...	3.7
20+	31	43	78	1	1	..	3.2	2.3	...
Total	64	56	131	8	1	2	12.5	1.8	1.5

Type V carriers in household contacts as compared with extra-familial contacts and in the random sample of the population of the village. The prevalence of carriers of Type V pneumococcus was distinctly higher in household contacts of cases of Type V pneumonia than in the other groups. The fact that the household contacts of cases were the first group cultured in Morris may have some bearing on the results of culture.

TABLE 8

Prevalence of Carriers of Pneumococci in Cannonsville, N. Y., as Shown by Survey, March 27 to April 13, 1939, According to Age and Type

Type of Pneumococcus	Number of Carriers: Under 20 Years	20 Years and Over	Total
VI	11	9	20
XI	2	7	9
XVIII	3	3	6
III	2	3	5
XXII	5	..	5
XIX	4	..	4
XXV	2	..	2
XIV	2	..	2
IV	..	1	1
VIII	..	1	1
XV	..	1	1
XX	1	..	1
XXI	1	..	1
XXIV	..	1	1
Not classified	2	2	4
Total positive	35	28	63

CANNONSVILLE STUDY

In a further attempt to obtain information as to the prevalence of carriers of pneumococci in an isolated village in which no cases of pneumonia had occurred recently, a survey was made in Cannonsville. Careful investigation revealed no evidence of any illness suggestive of pneumonia in the village or its vicinity from July 1, 1938, throughout the study. It is believed that the 307 persons from whom histories were obtained included almost every individual resident in the village at the time. In cultures from 199 individuals, 14 different types were isolated. As shown in Table 8, there were 20 carriers of Type VI pneumococci and 43 carriers of other types. Other than Type VI, Types XI and XVIII were the most frequently encountered. No carriers of Types I, II, V, or VII were found.

Table 9 shows the proportion of individuals cultured found to be carriers of Type VI and of all other types. It may be noted that 32 per cent of the individuals cultured were found to be carriers of some type of pneumococcus and that 10 per cent were found to be carriers of Type VI. Here, as in the other survey areas, the prevalence of carriers of pneumococci of all types was higher in younger individuals.

Table 10 compares the prevalence of carriers of all types of pneumococci in the three areas studied. The carrier rate was highest in Treadwell, especially in the age group under 20.

In Morris and Cannonsville, history was obtained as to the occurrence of upper respiratory illness during the 30 days preceding culture. Sixty-two per cent of the individuals interviewed in Morris gave a history of illness. The

TABLE 9

Results of Nose and Throat Cultures among Persons Cultured in Cannonsville, N. Y., March 27 to April 13, 1939

Results of Culture	Number of Persons: Under 20 Years	20 Years and Over	Total	Per cent of Total: Under 20 Years	20 Years and Over	Total
Type VI Pneumococcus	11	9	20	12.3	8.2	10.1
All other types	24	19	43	27.0	17.3	21.6
Total positive	35	28	63	39.3	25.5	31.7
Total negative	54	82	136	60.7	74.5	68.3
Individuals cultured	89	110	199	100.0	100.0	100.0

TABLE 10

Persons Cultured, Number and Per cent Found to Be Pneumococcus Carriers, by Age in the Three Study Areas

	Number Cultured			Number of Carriers			Carrier Rates Per cent			
Age	Treadwell	Morris	Cannonsville	Treadwell	Morris	Cannonsville	Treadwell	Morris	Cannonsville	Total
0–19	65	99	89	44	47	35	67.7	47.5	39.3	49.8
20+	126	152	110	30	26	28	23.8	17.1	25.5	21.6
Total	191	251	199	74	73	63	38.7	29.1	31.7	32.8

attack rate was higher in the group under 20 years of age.

Four cases of purulent otitis media were observed, 2 in cases of Type V pneumococcus pneumonia, 1 in an otherwise healthy carrier of Type V, and 1 in an individual whose throat culture was negative. Simple earache occurred in 13 persons: 2 cases of pneumonia, 1 Type V, and 1 untyped; 1 otherwise healthy carrier of Type V pneumococcus; 5 carriers of pneumococci of other types; and 5 individuals whose nose and throat cultures were negative for pneumococci.

History of recent respiratory illness was obtained less frequently in Cannonsville than in Morris. Thirty-eight per cent of those cultured had suffered from some mild upper respiratory illness in the 30 days preceding the culture. Three cases of acute suppurative otitis media occurred during this time, 1 in a carrier of Type III pneumococcus, and 2 in persons whose nose and throat cultures were negative for pneumococci. Four individuals suffered from simple earache, 2 of whom were found to be carriers of other than the predominating type, and 2 had negative nose and throat cultures.

Table 11 summarizes the prevalence of carriers of *all* types, according to age and history of illness in Morris and Cannonsville. Association of the carrier condition with illness seems to be indicated only in the younger age group.

Table 12 shows the prevalence of carriers of the predominating type of pneumococcus, and the prevalence of all other types according to age and prior illness. In Morris, the prevalence of carriers of the predominating type (Type V) was greater in those with prior illness in both age groups. In Cannonsville, the prevalence of carriers of the predominant type (Type VI) was higher in those with prior illness

TABLE 11

Number of Persons Cultured, and Per cent Found to Be Pneumococcus Carriers (All Types) According to Prior Respiratory Illness in Morris and Cannonsville

	History of Respiratory Illness					
	Number Cultured			Per cent Pneumococcus Carriers, All Types		
Place	Under 20 Years	20 Years and Over	All Ages	Under 20 Years	20 Years and Over	All Ages
Morris	73	83	156	50.7	16.9	32.7
Cannonsville	34	42	76	47.1	26.2	35.5

	No History of Respiratory Illness					
	Number Cultured			Per cent Pneumococcus Carriers, All Types		
Place	Under 20 Years	20 Years and Over	All Ages	Under 20 Years	20 Years and Over	All Ages
Morris	26	69	95	38.5	17.4	23.2
Cannonsville	55	68	123	34.5	25.0	29.3

TABLE 12

Pneumococcus Carrier Rates Per cent of Predominating Type and of All Other Types According to Age and Prior Respiratory Illness in the Three Study Areas

Place	Carrier Rates Per cent—Predominating Type					
	Under 20 Years		20 Years and Over		Total	
	History of Illness	No Illness	History of Illness	No Illness	History of Illness	No Illness
Morris	11.0	3.8	2.4	...	6.4	1.1
Cannonsville	26.5	3.6	7.1	8.8	15.8	6.5

Place	Carrier Rates Per cent—All Other Types					
	Under 20 Years		20 Years and Over		Total	
	History of Illness	No Illness	History of Illness	No Illness	History of Illness	No Illness
Morris	39.7	34.6	14.5	17.4	26.3	22.1
Cannonsville	20.6	30.9	19.0	16.2	19.7	22.8

only in the younger age group. There was very little difference in the prevalence of carriers of other than the predominating type in either Morris or Cannonsville, according to history of illness.

DURATION OF CARRIER STATE

An attempt was made to reculture all of the individuals, exclusive of cases, known to be carriers of Type I pneumococcus in Treadwell or of Type V pneumococcus in Morris. Repeated

TABLE 13

Pneumococcus Carrier Rates Per cent of Predominating Type and of Other Types According to Prior Respiratory Illness Corrected for Age*

Place	Corrected* Carrier Rates Per cent			
	Predominating Type		Other Types	
	History of Illness	No Illness	History of Illness	No Illness
Morris	5.8	1.5	24.4	24.2
Cannonsville	14.7	6.7	19.6	22.0

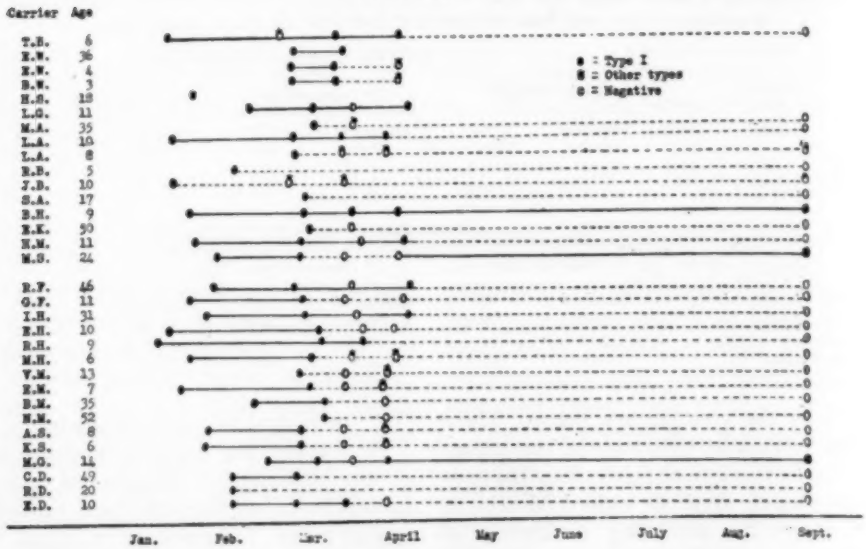
* Age correction made by using entire population cultured

Table 13 shows the prevalence of carriers of the predominant type and all other types in Morris and Cannonsville, corrected for age, using the entire cultured population of the three areas for age correction. In both Morris and Cannonsville, the prevalence of carriers of the predominating type was higher in those with a history of prior illness, but the differences are not statistically significant. There was no difference in the observed prevalence of carriers of types other than the predominant type according to history of illness in either area.

cultures were obtained from 31 of the 32 carriers of Type I pneumococcus in Treadwell. Twenty-two of these were found to continue to carry this type of pneumococcus for from 2 weeks to 3 months, and reculturing of 27 of the original 32 approximately 7 months later showed that 3 were carriers of Type I pneumococcus at that time. Figure 4 shows the duration of the carrier state of the Type I carriers as indicated by reculturing.

Repeated cultures were taken on the Type V carriers at Morris at intervals of approximately 2 weeks. In only 5

FIGURE 4—Duration of Type I Carrier State as shown by repeated culturing Treadwell, N. Y.

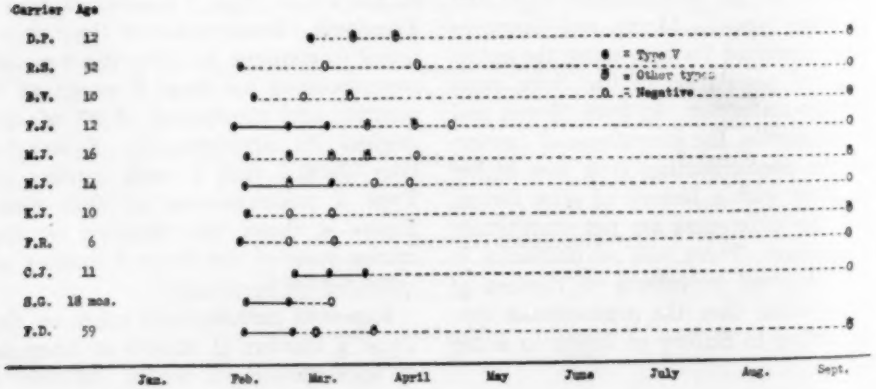


individuals were more than one positive culture obtained. The carrier condition was shown to have persisted for at least 2 weeks in 1, and for at least 1 month in 2 of the original carriers. Nine of the original carriers were recultured 6 months later, and none was found to be a carrier of Type V pneumococcus. Figure 5 shows the results of repeated culturing in persons found to be carriers of Type V during the survey. A comparison of these two series of observations shows a difference in the duration of the carrier state which apparently may vary according to type.

SUMMARY AND CONCLUSIONS

Pneumococcus carrier surveys were made in three isolated rural areas in New York State, in one of which at

FIGURE 5—Duration of Type V Carrier State as shown by repeated culturing Morris, N. Y.



the time of the beginning of the study no cases of pneumonia had occurred for a considerable time, yet a high prevalence of carriers of Type I pneumococcus was found. Subsequent to the beginning of the study, 2 cases of Type I pneumonia occurred in this area. The prevalence of Type I pneumonia in this community could hardly be regarded as constituting an epidemic and yet a carrier prevalence was observed in the general population fully as high as or higher than that usually encountered among contacts to cases. Moreover, this marked prevalence of carriers of Type I pneumococci preceded the occurrence of the first case of pneumonia. No Type V carriers were discovered in this survey.

In the survey carried out in an area in which Type V pneumococcus pneumonia was present in epidemic proportions, more carriers of the homologous type of pneumococcus were found than of any type other than Type III, but these were confined almost exclusively to household contacts to known cases of Type V pneumonia. Only one carrier of Type I pneumococcus was found in this area.

A similar study in a third village in which no pneumonia had occurred for at least 6 months preceding the survey revealed no carriers of Type I or V pneumococci. Type VI was found to be the predominating type of pneumococcus in this area.

Respiratory illnesses other than pneumonia were more prevalent in the area in which Type V pneumonia was highly prevalent than in the area in which there were no cases of pneumonia. There was a slightly higher prevalence of carriers of pneumococci of the predominant type among persons in the younger age group who gave a history of respiratory illness other than pneumonia in both areas but these differences were not statistically significant.

The findings in these surveys seem to indicate that:

1. Infection with Type I pneumococcus may be widespread in the absence of a high prevalence of Type I pneumococcus pneumonia and a high prevalence of carriers of Type I pneumococcus may precede the occurrence of cases.

2. Epidemics of Type V pneumonia may not be associated with a continued high prevalence of carriers of this type of pneumococcus in the general population. In the Type V epidemic studied, the prevalence of carriers of the homologous type was limited primarily to household contacts of clinical cases of pneumonia. However, the fact that the household contacts were cultured first may have some bearing on this observation, especially in view of the evidence of a short duration of the Type V carrier state.

3. There may be a relatively high prevalence of carriers of Type VI pneumococci in the absence of pneumonia due to this type.

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The Cost of Slums

THE cost of slums as noted in a recent publication of the United States Housing Authority:

A Hartford study showed that slum areas occupying a tenth of the area of the city house a fourth of the city's population. From these slum areas came 51 per cent of all tuberculosis cases, 57 per cent of all juvenile delinquency, and 62½ per cent of all arrests for adult delinquency.

This is what a study made in Cleveland showed:

Area	*Per Capita Cost for Fire Protection*	*Per Capita Cost for Police Protection*	*Per Capita Cost for Public Health Work*
One large slum area	$18.27	$11.50	$2.02
Rest of City	2.74	4.20	0.60

U. S. Municipal News, 7, 4 (Mar. 1), 1940.

Immunization against Pneumonia*

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THE statement by the late Sir William Osler that pneumonia is the king of all diseases, killing the same number from year to year despite any form of treatment, has remained true until the last decade. Since the improvement of antipneumococcus serum and its more accurate standardization to insure therapeutic doses, and more recently the use of sulfapyridine—really a synthetic antibody—there is promise of a great reduction in the mortality rate in the general population. However, this successful program for the cure of this disease will not conceivably have a bearing upon incident rate. Up to the present, no measure has proved itself adequate to reduce this rate satisfactorily. This is true despite improvement of sanitary conditions, advance in knowledge of adequate diet—especially in relationship to the use of vitamins—and other measures which tend to improve the health of the individual. Yet in some other infectious diseases, such as tuberculosis and scarlet fever, there has been a steady decrease in incidence and severity of the diseases not accounted for by any single measure. It is this constant pneumonia incident rate which makes it seem worth while to undertake anew an evaluation of active immunization as a prophylactic measure.

In experiments on active immunization in the past, whole-cell polyvalent vaccine in some form was used as an antigen. However, such studies as those of Maynard,[1] Lister,[2] Cecil and Austin,[3] Lister and Ordman,[4] and others, indicate the possibility of making a significant reduction in incidence. This reduction was reported by many investigators to be from 25 per cent to as high as 75 per cent. In taking up the problem again, the antigen employed is an antigenic polysaccharide. This substance has been chosen since it has been shown to contain more immunizing doses than the cells from which it was derived, and because it is soluble, stable, easily sterilized and standardized, and free from reaction-producing characteristics. Assuming that this antigen is as good as any so far tested, it is necessary to take into consideration the following well recognized variables which enter the complex problem of active immunization: namely, the multiplicity of types found in the human host; the short duration of serum antibodies following either the disease or active immunization; the incidence of the disease; and variation in response to a pneumococcus vaccine. Natural immunity is omitted from this list of variables inasmuch as no satisfactory method has been devised to measure such an attribute in the human host.

The problem of the multiplicity of types which cause this disease involves the preparation of a satisfactory polyvalent antigen. The whole-cell vaccine

* Read before the Health Officers Section of the American Public Health Association at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 18, 1939. This is one of a series of studies carried out in part under a grant from the Influenza Commission of the Metropolitan Life Insurance Company.

is highly type-specific; and to attempt to make a vaccine of the entire 36 types of pneumococci would be a laborious and unquestionably an impractical procedure. For this reason, endeavors have been made to discover if possible the "common denominator" of this large number of specific types. The results so far have been simply suggestive of such a possibility. It has been found that polysaccharide prepared by the calcium phosphate method [5] from Type I organisms stimulates antibody response in human beings against Type II almost as well as against the specific organism. This is true despite the facts that the immunity obtained in mice is type-specific, and that the antigen does not contain the species-specific C substance of Tillett and Francis.[6] Whether or not it will be possible to isolate or prepare an antigen which will produce an active immunity against all types is a mere speculation which awaits further investigations.

It has long been recognized that serum antibodies following pneumonia persist for a relatively short time, 3 months to 1 year. The antibodies stimulated by the polysaccharide antigen persist for varying lengths of time in different individuals from 6 months to 2 years, the longest period tested. It is pertinent, however, to recall Cole's investigation in 1904 [7] in which he found that after an animal had been immunized once to typhoid, a second immunization occurred more readily than the first. An excellent example of such a phenomenon in humans is found in the work of Siler and Dunham [8] in which it was shown that, after the regular course of typhoid vaccination in 100 individuals, a single dose smaller than any of the 3 doses given previously resulted in stimulation of serum antibodies of as high titer as produced by the 3 original doses. It would thus appear that the tolerance once established in the host has stimulated the biological processes necessary for development of such tolerance and that this increased activity is a more or less permanent characteristic. Hence it is conceivable that once immunized against pneumococcus infection, a high potential resistance may persist for a much longer time than is indicated by the presence of serum antibodies.

The incidence of pneumonia is high compared to many other infectious diseases, and in the general population of the United States, annually the average is approximately 1 in every 500 individuals. This rate includes all age groups, and is highest under 1 year and past middle age. Thus it would be necessary to immunize 500 to protect one individual against the disease until methods are devised to measure susceptibility. If it is found that active immunity remains only as long as serum antibody persists, it would be necessary to immunize the general population once every 1 or 2 years—truly an expensive program and a heavy personal tax. The logical procedure perhaps would be to discover why only the one individual succumbs, in view of developing means of prevention in those found to be susceptible. Certainly it has been established by many investigators that a high percentage of individuals, especially in the winter season, harbor pneumococci at least for a short time. The query is therefore: why with this high carrier rate is the incidence only one in 500?

One possible explanation of the incidence of pneumonia is the thesis of this paper. Early in our work on the use of an antigenic polysaccharide,[9] as well as whole-cell vaccine, great individual variation of response was noted as measured by the serum antibody content following injection. Gradually over a period of years data have been accumulated on slightly over a thousand individuals who have been immunized with an antigenic pneumococcus poly-

TABLE 1

Individual Variation in Antibody Response

Type I

		Lethal Doses *													
		Number Before Immunization							Number After Immunization						
Ages	Total	0	1	10	100	1,000	10,000	100,000	0	1	10	100	1,000	10,000	100,000
2–9	5	5	0	0	0	0	0	0	0	0	0	0	5	0	0
10–19	166	114	21	13	10	4	4	0	4	4	5	17	41	51	44
20–29	314	213	53	18	18	5	6	1	10	4	17	28	84	89	82
30–39	232	169	35	7	7	8	3	3	13	9	18	30	62	57	43
40–49	152	97	30	8	9	5	3	0	10	4	14	17	36	39	32
50–59	129	79	28	9	7	3	2	1	13	2	10	11	30	30	33
60–69	80	50	21	3	4	2	0	0	7	4	8	10	13	15	23
70–79	21	18	2	0	0	1	0	0	3	2	2	2	2	7	3
Totals	1,099	745	190	58	55	28	18	5	60	29	74	115	273	288	260

* Lethal doses against which 0.1 cc. serum protects mice

saccharide. The dose used in this group was not constant, but inasmuch as comparisons with the same dose of antibody were made in relatively large subgroups, and the variation in antibody content occurred to the same degree when an antigenic dose was given, it seemed valid to include them all in this general summary. The procedure published elsewhere,[10] using a mouse protection test to estimate serum antibody, was employed throughout this experiment. In the data given in the following tables, these points are to be emphasized: (1) the number of individuals who had antibody in the blood prior to immunization; (2) the general response in different age decades; (3) the great variability in antibody titer irrespective of age; and (4) the number of individuals who failed to respond to the antigen.

First, it may be noted in Tables 1 and 2 that out of the 1,099 persons tested against Type I prior to immunization, the average of those having some antibody is 354, or 32.2 per cent, and against Type II (Tables 3 and 4) 357 out of 1,098, or 32.6 per cent. The titer of the serum is for the most part low in comparison with the serum following immunization. In contrast the same group after immunization give demonstrable serum antibodies with Type I in 94.5 per cent and with Type II in 98.9 per cent. These figures of course

TABLE 2

Individual Variation in Antibody Response

Type I

		Lethal Doses *													
		Per cent Before Immunization							Per cent After Immunization						
Ages	Total	0	1	10	100	1,000	10,000	100,000	0	1	10	100	1,000	10,000	100,000
2–9	5	100.0	0	0	0	0	0	0	0	0	0	0	100.0	0	0
10–19	166	68.6	12.6	7.8	6.0	2.4	2.4	0	2.4	2.4	3.0	10.2	24.6	30.7	26.4
20–29	314	67.8	16.8	5.7	5.7	1.5	1.9	0.3	3.1	1.3	5.4	8.9	26.7	28.3	26.0
30–39	232	72.9	15.0	3.0	3.0	3.4	1.2	1.2	5.6	3.8	7.7	12.9	26.7	24.6	18.5
40–49	152	63.8	19.7	5.2	5.9	3.2	1.9	0	6.5	2.6	9.2	11.1	23.6	25.6	21.0
50–59	129	61.2	21.7	6.9	5.4	2.3	1.5	0.7	10.0	1.6	7.7	8.5	23.2	23.2	25.5
60–69	80	62.5	26.2	3.7	5.0	2.5	0	0	8.7	5.0	10.0	12.5	16.2	18.7	28.7
70–79	21	85.7	9.5	0	0	4.7	0	0	14.2	9.5	9.5	9.5	9.5	33.3	14.2
Totals	1,099	67.8	17.2	5.3	5.0	2.5	1.6	0.5	5.5	2.6	6.7	10.4	24.8	26.2	23.6

* Lethal doses against which 0.1 cc. serum protects mice

include those of sera protecting against only 1 or 10 lethal doses. Such increase in antibody following immunization has some influence on the incidence of the disease. For in our study over a period of 4 years in coöperation with the U. S. Army and with officials of the CCC camps,[11] in which 60,000 volunteers were immunized with 72,000 controls, there was a reduction of incidence of 50 per cent and the mortality of those in the immunized group who contracted the disease was lower than in the controls.

It is well known from clinical observations by many physicians that the incidence of pneumonia is very high from birth to 1½ years, it decreases to about 15 years, and then increases rather rapidly in succeeding decades. Whether or not this is due to a worn-out antibody mechanism, or to some yet unknown factor awaits demonstration. In Charts 1 and 2 are plotted the percentages of individuals from 10 to 79 years whose sera showed antibody prior to immunization and those who developed antibody following immunization. It may be observed that in both types, there was no great reduction in the percentage of individuals who had antibody prior to immunization in the different ages up to 60–69, but there was a somewhat lower rate in the 70–79 group. However, insufficient numbers were studied in this latter group (Type I 21, Type II 20) to make these observations comparable to those in the earlier decades. It is of interest to add that serum antibodies are rarely found in infants and the percentage increases with age apparently in proportion to the number of human contacts. In contrast, after immunization, with Type I there was a gradual decrease in the response with advancing years, but with Type II all those in the decades 10–19, 60–69 and 70–79 responded, the few non-reactors being found in the decades 20–59. However, as seen in Table 3, there was significant variation in the degree of response in these latter decades similar to Type I. Thus in the case of Type I, there is some evidence to indicate the possibility that increased incidence may be due at least in part to a worn-out immunological mechanism. This apparently is not the case with Type II. However, there is no significant difference between Types I and II in the variation in response with advancing years. This variation may well be as important a consideration to indicate the possible susceptibility of the individual as the relative numbers who failed to respond.

The high carrier rate of pneumococci in comparison to the relatively low incidence indicates definitely the existence of variation in individual resistance to pneumococcus infection. In our opinion, this is true even taking into consideration any one of the many theories as to the mechanism of the infection which results in the production of lobar pneumonia. Experimentally it has been shown by many investigators that resistance to different organisms as well as toxins varies in different animal species and in different members of one species. Whether or not the presence of serum antibody in humans indicates resistance to pneumonia, the response to the antigen used demonstrates clearly a variation in ability to manufacture this antibody. In Table 2, it is seen that of this group, irrespective of age, 2.6 per cent had sufficient antibody to protect against one lethal dose of Type I, 6.7 per cent against 10, 10.4 per cent against 100, 24.8 per cent against 1,000, 26.2 per cent against 10,000, 23.6 per cent against 100,000 lethal doses. Although a higher number of individuals responded well, the same general curve is found with respect to Type II (Table 4). A great many of the sera which protected against 100,000 lethal doses were titrated further and some protected against 1,000,000 and

TABLE 3

Individual Variation in Antibody Response

Type II

		Lethal Doses *													
		Number Before Immunization							Number After Immunization						
Ages	Total	0	1	10	100	1,000	10,000	100,000	0	1	10	100	1,000	10,000	100,000
2–9	3	3	0	0	0	0	0	0	0	0	2	0	1	0	0
10–19	155	110	25	6	6	4	2	2	0	0	2	7	31	44	70
20–29	318	200	56	13	30	13	6	0	2	3	7	18	80	85	123
30–39	237	160	32	10	22	4	5	4	5	0	12	17	46	64	93
40–49	156	100	25	6	15	4	6	0	2	2	4	12	25	46	65
50–59	132	98	17	3	7	1	4	2	3	0	5	6	22	37	59
60–69	77	54	8	2	8	2	3	0	0	1	2	6	12	29	27
70–79	20	16	1	1	0	2	0	0	0	0	2	2	4	9	3
Totals	1,098	741	164	41	88	30	26	8	12	6	36	68	221	314	440

* Lethal doses against which 0.1 cc. serum protects mice

a few against as high as 10,000,000 lethal doses. Inasmuch as the entire group was not so tested, these observations are omitted from the present tables; the higher titers are included in the 100,000 column. The degree of antibody response is unexpectedly high. Yet from our original experiments, as well as experiments now under way, on comparison of the whole-cell vaccine with polysaccharide antigen, variations are not due to the polysaccharide antigen, for this same wide difference in response in various individuals is found with whole-cell vaccine. Although the results so far indicate a reduction of incidence by active immunization, it is pertinent to realize that this reduction is only 50 per cent, and hence a significant number of cases occur in the injected group. It is possible therefore that the cases occur in individuals whose response to the antigen is of low degree.

Certain individuals were unable to manufacture antibody following injection of this polysaccharide antigen. The numbers are given in Tables 1 and 3. It is seen that out of 1,099, 60 individuals, or 5.5 per cent, failed to respond to Type I, and with Type II out of 1,098, 12, or 1.1 per cent, failed. In other words, 1 in 20 individuals failed with Type I and 1 in 100 with Type II. In view of the high carrier rate, the number of negative reactors

TABLE 4

Individual Variation in Antibody Response

Type II

		Lethal Doses *													
		Per cent Before Immunization							Per cent After Immunization						
Ages	Total	0	1	10	100	1,000	10,000	100,000	0	1	10	100	1,000	10,000	100,000
2–9	3	100.0	0	0	0	0	0	0	0	0	66.7	0	33.3	0	0
10–19	155	70.9	16.1	3.9	3.9	2.6	1.3	1.3	0	0	1.3	4.5	20.1	28.5	45.4
20–29	318	62.8	17.6	4.0	9.4	4.0	1.9	0	0.6	0.9	2.2	5.6	25.1	26.7	38.6
30–39	237	67.5	13.5	4.2	9.2	1.7	2.1	1.7	2.1	0	5.0	7.1	19.4	27.0	39.2
40–49	156	64.1	16.0	3.8	9.6	2.6	3.8	0	1.3	1.3	2.6	7.6	16.0	29.4	41.6
50–59	132	74.2	12.9	2.3	5.3	0.7	3.0	1.5	2.3	0	3.8	4.5	16.6	28.0	44.6
60–69	77	70.1	10.4	2.6	10.4	2.6	3.9	0	0	1.3	2.6	7.8	15.5	37.6	35.9
70–79	20	80.0	5.0	5.0	0	10.0	0	0	0	0	10.0	10.0	20.0	45.0	15.0
Totals	1,098	67.4	14.9	3.7	8.0	2.7	2.3	0.7	1.1	0.5	3.3	6.2	20.1	28.6	40.0

* Lethal doses against which 0.1 cc. serum protects mice

CHART 1—ACTIVE IMMUNIZATION—TYPE I PNEUMOCOCCUS
1,099 Individuals, Ages 10–80 Years—Per cent with Serum Antibodies

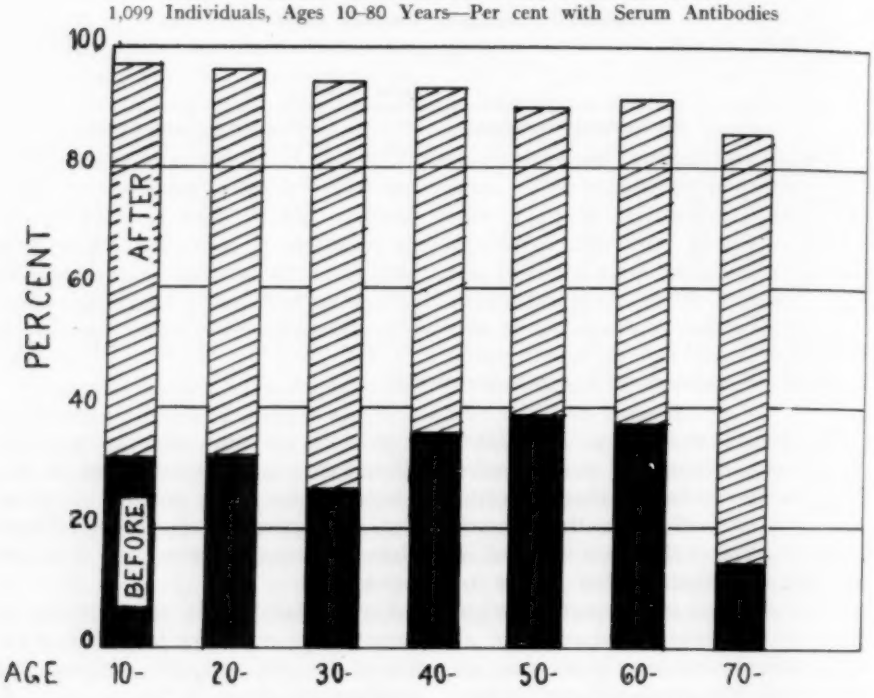
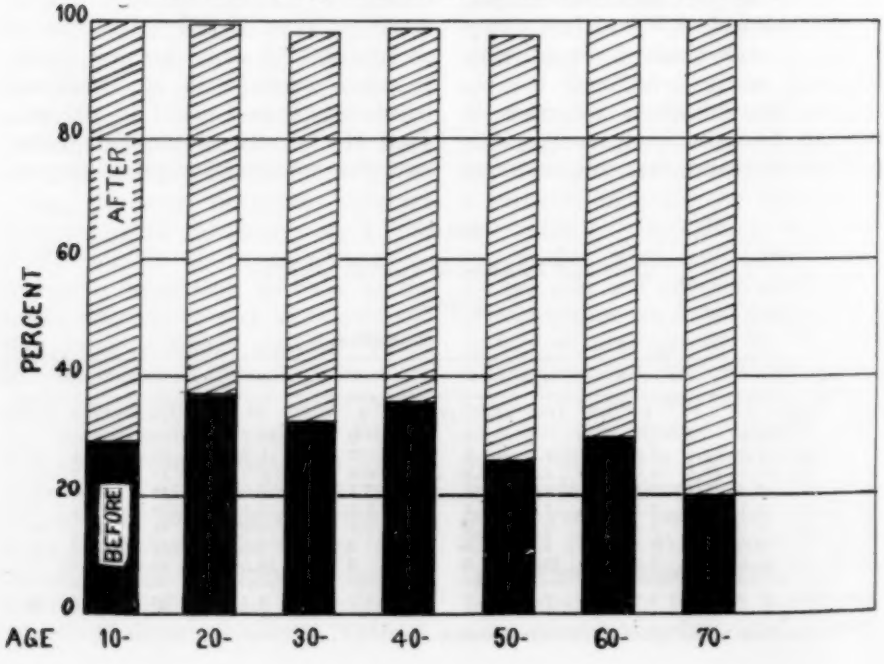


CHART 2—ACTIVE IMMUNIZATION—TYPE II PNEMECOCCUS
1,098 Individuals, Ages 10–80 Years—Per cent with Serum Antibodies



may be sufficient to account for the incidence of the disease. Again if to the negative reactors are added those who responded only to the degree that 0.1 cc. serum protected against 1 and 10 lethal doses, there are 14.8 per cent with Type I, and 4.9 per cent with Type II who might be considered poor reactors. Thus it is conceivable that this variation in response to the present antigen provides a means for estimating the degree of individual resistance to pneumonia and thus makes it possible to separate the resistant from the susceptible individuals.

Accordingly, from the fact that the use of this polysaccharide antigen results in only 50 per cent reduction in incidence, and that there is a very great variation in individual response to this antigen, it seems worth while to attempt to separate a sufficiently large sample of the population into the good and the poor reactors to determine whether such a separation divides the non-susceptibles from the susceptibles. The mouse protection test is obviously impractical as a means of making such division. The skin test of Francis and Tillett,[12] reported to indicate serum antibody, suggested itself as of possible value for this purpose. A preliminary trial, in collaboration with Prather,[13] has shown that the skin test prior to immunization has a low degree of correlation with serum antibodies as estimated by the mouse technic; however, after immunization, the correlation is somewhat over 80 per cent. Whether or not a higher correlation can be obtained by improvement in the antigen is a problem now being investigated. At any rate, the test makes a rather arbitrary selection, and preliminary work on small groups is being done now to see whether or not the incident rate is low or nil with those who give a skin-positive test, and high in the negative group. The need of a relatively large sample of the population to obtain significant results is obvious; and until such an opportunity is afforded, the final answer to the present hypothesis cannot be made. However, if it is found that susceptibility can be measured by the ability of the host to produce antibody, and if this is found to be a constant characteristic of the host, then the positive skin test or positive serum antibody following an immunizing dose would indicate that the high resistance to pneumococcus is a permanent attribute. Consequently efforts to increase host resistance could be limited to a relatively small sample of the population, the negative reactors, and thus a feasible program of prophylaxis against pneumonia and pneumococcus infections could be planned.

The questions asked the author repeatedly as to practical methods for prevention of pneumonia, or whether the time is ripe to attempt general immunization, are answered in the above discussion. It is suggested that those who are interested may help evaluate the polysaccharide antigen by following the positive and negative reactors over a period of years to determine the incidence of pneumonia in these two groups. The state or county health units would be able to carry out such a program with a minimum of expense. Certain areas might be chosen with a relatively stable population so that a satisfactory follow-up system could be arranged. Certainly an initial period of 3 years should be allotted to such an experiment.

Although there are other factors to be considered in development of a better understanding of the epidemiology of this disease, our interpretation of the data here presented supports the assumption that one important factor is the variability of the human host to respond to an active immunizing antigen. The chance for spreading of infection from one individual to another is great as indicated by the high carrier

rate. Consequently the host factors must influence the actual infection with the final outcome—lobar pneumonia. If the carrier responds well to the type of organism harbored, antibody will be produced and the resistance increased markedly, and the individual may be considered immune. This assumption must take into consideration the antigenicity for humans of any one type or all types of the pneumococcus. On the other hand, in the individual who cannot respond to such an antigen, the likelihood of invasion would be increased and a state of hypersusceptibility might be thought to exist. This hypothesis can only be verified as it is found that the degree of response to an active antigen is a permanent characteristic of any one individual, that is, if negative reactors remain negative and positive remain positive. This in turn may be proved if, under conditions of a well conducted experiment in a sufficiently large sample of the general population, the incidence of pneumonia in the poor reactors is high, and in the good reactors is low.

SUMMARY AND CONCLUSIONS

In a study of 1,099 individuals before and after immunization with an antigenic pneumococcus polysaccharide, polyvalent Types I and II, the following conclusions may be made: (a) the percentage of individuals with antibody prior to immunization is with Type I 32.2 per cent and with Type II 32.6 per cent; (b) after immunization, the percentage showing serum antibodies is respectively for Type I 94.5 per cent and for Type II 98.9 per cent; (c) this response shows no significant variation in the different age groups; (d) irrespective of the age groups tested, the response as indicated by serum antibody titer varies from protection by 0.1 cc. serum against 100,000 lethal doses to that against as little as 1 lethal dose; (e) certain individuals fail to produce antibody—with Type I out of 1,099 there were 60, or 5.5 per cent, and with Type II, 12, or 1.1 per cent. It is suggested that this individual variation to pneumococcus polysaccharide antigen is an important factor in the relative resistance to pneumococcus infection.

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Basic Principles of Industrial Sanitation*

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A CRYSTALLIZATION of our concepts of industrial hygiene has been taking place during the past few years. Objectives have always been clearly fixed, but the magnitude of the problems that have faced students in this field has delayed a rationalization of its proper place in a public health program. Now, with a long record of achievements, industrial hygiene has acquired a status and may be regarded as a science with distinctive attributes.

It is not so long ago that industrial hygiene embraced merely the knowledge that occupational diseases and environment were intimately related. This in itself was significant, yet so long as the quantitative aspects of the relationship were undefined, it is doubtful that the great strides made in the past few years could have been possible. Until measurable bench marks could be developed there was no opportunity for industry to gage the worker's environment in so far as it affected health, and certainly no chance for government to enforce rules and regulations. It is to the credit of recent investigators, both physicians and engineers, that the quantitative aspects of industrial hygiene have been developed and placed upon a firm foundation. Industrial hygiene has given us new tools for research and a still newer and more wholesome approach to studies in many related fields; notably it has created the science of "air sanitation." Problems still remain with us as great as those already solved, but unlike earlier investigators who had to develop tools as well as technics, we have a better comprehension of the rôle played by the industrial environment on the health of workers, and thus are able to apply them more effectively. As will be evident in the paragraphs which follow, industrial hygiene consists chiefly in applying certain parts of more fundamental sciences to the control of the industrial environment.

For the purposes of discussion, we may consider industrial hygiene as organized along the lines shown in Figure 1. This diagram is not intended to make any distinction in the fields of engineering and medicine. The two must be regarded as complementary. Much of the success achieved by industrial hygiene units in this country has been due to the close relationships which have existed between these two professions. It is this association that has given force and direction to industrial hygiene as a science.

* Read at a Joint Session of the Engineering and Industrial Hygiene Sections of the American Public Health Association at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 18, 1939.

† Deceased June 13, 1939.

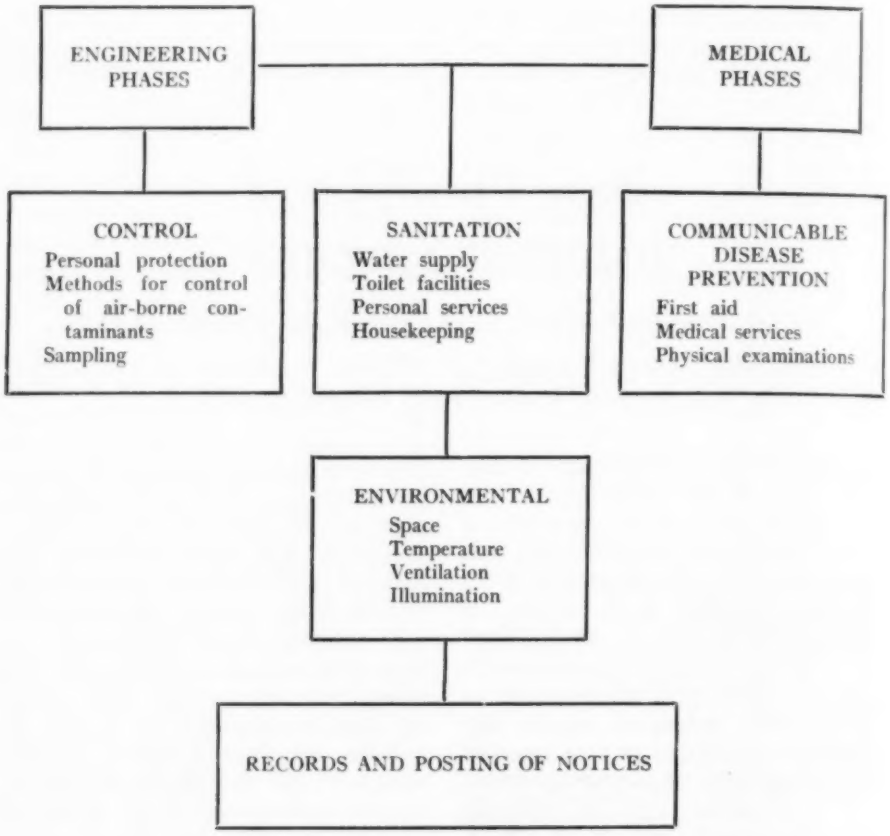

FIGURE 1—*Relationship of engineering and medical phases of industrial hygiene*

SANITATION PRINCIPLES ‡

The principles of sanitation applied to the industrial environment do not differ from those forming a part of community sanitation. Their primary purpose is to control the causative factors of disease. However, in accordance with the accepted definition of sanitation, the principles are interpreted as applying to the prevention of diseases other than occupational. Thus, they are concerned with the provision of safe drinking water, sanitary toilets, rat-proofing, screening (in southern regions), good housekeeping, clean lunch rooms, and the collection and disposal of wastes which are associated with the diarrheal diseases, plague, malaria, tetanus, lockjaw, and tuberculosis, to mention a few.

‡ These principles and those which follow are adopted from the text of a bulletin entitled "Basic Principles of Industrial Hygiene and Sanitation," by R. R. Sayers, J. M. DallaValle, and R. R. Jones, National Institute of Health, U. S. Public Health Service, unpublished.

WATER SUPPLY

1. There should be provided, in all places of employment, an approved supply of clean, cool, wholesome, and safe drinking water.

2. All water furnished for drinking purposes should be from a source approved by the local health authorities having jurisdiction. When such is not available, the state authorities should furnish directions for rendering the water safe for human consumption.

3. The temperature of the water supplied for drinking purposes should not be lower than 40° F., nor greater than 80° F., and preferably between 45° F. and 50° F.*

4. Where sanitary drinking fountains are provided, they should be of an approved type and construction.† At least one drinking fountain should be provided for every 50 persons employed.

5. In all instances where water is cooled by ice, the construction of the container should be such that the ice does not come in direct contact with the water.

6. The common drinking cup should be prohibited.

7. When individual drinking cups (to be used but once) are supplied, a suitable container should be provided for the unused cups, as well as a receptacle for disposal of the used cups.

8. Open containers such as barrels, pails, or tanks for drinking water for general use, from which the water must be dipped or poured, whether fitted with a cover or not, should not be allowed.

9. Where water is taken from an unapproved source and is used for industrial processes or fire protection, notices should be posted stating clearly that such water is unsafe and not to be used for drinking, and every reasonable effort should be made to prevent it being so used. There should be no pipe connection, open or potential, between a system furnishing water for drinking purposes and a system furnishing water for other uses.

TOILET FACILITIES

1. Every place of employment should be provided with adequate water closets, chemical closets, or privies, separate for each sex. Wherever privies are permitted, they should be constructed in accordance with the *Specification for the Sanitary Privy (Supp. 108, Pub. Health Rep.)*.

2. Covered receptacles should be kept in all toilet rooms used by females.

3. In each toilet room an adequate supply of toilet paper, in proper holder, should be provided, and it should be of material which will not obstruct fixtures or plumbing.

4. Unless the general washing facilities are on the same floor and in close proximity to the toilet rooms, adequate washing facilities should be provided in every toilet room or any room adjacent thereto.

5. Toilet rooms should be readily accessible to employees using them. No toilets should be more than one floor above or below the regular place of work of the persons using them. This rule need not apply when passenger elevators are available for employees' use in going to and from toilet rooms.

6. Toilet facilities (closets) should be provided for each sex according to Table 1. The number to be provided for each sex should in every case be based on the maximum number of persons of that sex employed at any one time on the premises for which the facilities are furnished. When persons other than employees are permitted the use of toilet facilities (closets) on the premises, a reasonable allowance should be made for such other persons in estimating the minimum number of toilet facilities (closets) required.

TABLE 1

Toilet Facilities Recommended

Number of Persons	*Minimum Number of Facilities*
1 to 9	1
10 to 24	2
25 to 49	3
50 to 100	5
Over 100	1 for each additional 30 persons

7. Whenever urinals are provided, one facility less than the number specified in Table 1 may be provided for males for each urinal, except that the number of facilities in such cases may not be reduced to less than two-thirds of the number specified in the table. Two feet of acid-resisting porcelain enamel urinal may be considered as equivalent to one urinal.

8. Every new urinal installed should be made of material that is impervious to moisture. Cast, galvanized iron, sheet metal, or steel urinals should be prohibited unless coated with vitreous enamel. Where slate is used, it should be of the best quality.

9. The floor to a distance of not less than 24" in front of all urinals should be constructed of waterproof material, and whenever new wall or vertical slab urinals are installed, the floor in front of the urinals should slope toward the urinal trough.

10. Every urinal should be flushed from a separate water supply system or through flush valves. Every such system hereafter installed should use not less than 1 gallon for each discharge for every fixture or stall. In place of such discharge from a flush system or valve, water may be allowed to run continuously over slab urinals.

11. The walls of compartments or partitions between fixtures may be less than the

* Usual practice.
† See reference 9.

height of the room walls, but the top should be not less than 6′ from the floor, and bottom not more than 1′ from the floor.

12. The door to every toilet room should be fitted with an effective self-closing device and screened so as not to be visible from the workroom. All "compartment" doors should be supplied with latches.

13. In all new toilet rooms installed, the floors and side walls to a height of 6″ including the angle formed by the floor and the side walls should be watertight and impervious to moisture.

14. The floors, walls, and ceilings of all toilet rooms should be of a finish that can easily be cleaned.

15. The walls of every toilet room should be of solid construction and should extend to the ceiling, or the area should be independently ceiled over. Above the level of 6′ the wall may be provided with glass that is translucent but not transparent.

16. In new installations the minimum floor space allotted for toilet facilities (closets), lavatories (wash basins), and urinals should be as shown in Table 2.

TABLE 2

Space Allotment for Toilet Facilities

	Minimum Width	*Minimum Depth*	*Minimum Total Floor Space*
	In.	*Ft.*	*Sq. Ft.*
Facilities	32	3.6	16
Lavatories	24	3.6	12
Urinals	24	3.6	12

17. The construction and maintenance of toilet fixtures should comply with the state or local building and plumbing codes, where such codes exist. In other cases, it is suggested that the requirements of *Bulletin of Building and Housing 13* of the Bureau of Standards, U. S. Department of Commerce, be followed.

18. Every water closet bowl should be set entirely free and open from all enclosing woodwork, and should be so installed that the space around the fixture may be cleaned easily.

19. Every water closet, except those of the integral seat type, should have an open-front seat made of substantial material. If absorbent material is used, the seat should be finished with varnish or other substance to make it impervious to moisture, and should preferably be light in color.

20. Chemical closets and privies should not be permitted except where no sewer is accessible, and no privy should be permitted where it is impossible to construct and maintain the same without danger of contaminating any source of drinking water.

21. When chemical closets are used they should be of a type approved by the health authorities having jurisdiction, and should be maintained in a sanitary condition.

22. The container should be changed frequently enough that it will not be allowed to become more than two-thirds full; the contents at all times to be disposed of in accordance with the regulations of the health authorities having jurisdiction.

23. In every establishment employing more than 25 persons, the use of privies should be prohibited. In such instances where permitted, they should be constructed and maintained in accordance with *Specifications for the Sanitary Privy (Supplement 108* of the *Public Health Reports)*.

24. No privy should be located within 100′ of any room where foodstuffs are stored or handled.

25. All toilet rooms having windows should be equipped with screens.

WASHING FACILITIES

1. Adequate facilities for maintaining personal cleanliness should be provided in every place of employment. The same should be convenient for the employees for whom they are provided, and should be maintained in a sanitary condition.

2. At least one lavatory (wash basin) with adequate water supply should be provided for every 10 employees or portion thereof, up to 100 persons; and one lavatory (wash basin) for each additional 15 persons or portion thereof. Twenty-four inches of sink with individual faucet may be considered equal to one basin. Soap in a suitable dispensing container should be provided at each wash place.

3. Separate wash rooms should be provided for each sex. Where such rooms adjoin, the enclosing walls should be of solid construction.

4. Every new wash basin installed should be made of vitreous, glazed, artificial, enameled iron, or other glazed material impervious to water. Galvanized cast iron may be permitted for sinks.

5. Unless the general washing facilities are on the same floor and in close proximity to the toilet room, at least one wash basin should be provided in each toilet room or room adjacent thereto.

6. All floors under sinks and basins should be kept sanitary and in good repair.

7. The common towel is prohibited.

8. Individual towels of cloth or paper should be provided and proper receptacles

maintained for disposing of used towels. Other apparatus for drying the hands may be substituted for towels only after approval by the enforcing authority.

9. A lavatory (wash basin), supplied with hot and cold water from 1 faucet, should be provided for every 5 employees exposed to skin contamination with poisonous, infectious, or irritating material.

10. One shower bath with an ample supply of hot and cold water from one fixture should be provided for every 15 workers or less exposed to skin contamination with poisonous, infectious, or irritating material.

11. No strong alkali or harsh abrasive soaps should be permitted.

12. Oils or solvents used for removing dyes, or other contaminants from the skin, which are not ordinarily removed by soap and water, should be used sparingly. Workers should not be permitted to dip their hands in any cleaning oil or solvent, but should place a small amount on clean wiping cloths provided by the employer.

13. Water from any source not approved by the state or local authorities should not be used for wash purposes.

PERSONAL SERVICES

1. In workshops, factories, or other places of employment where it is necessary for male employees to change their clothing or where females are employed, adequate separate dressing rooms with lockers for males and females should be provided.

2. All personal service rooms should be, so far as possible, screened and otherwise protected so as to prevent the entrance or harboring of rats, insects, or vermin of any kind in such quarters, and they should be maintained in a sanitary condition.

3. Dressing rooms should be provided for men whenever the type of work performed involves exposure to excessive dust, dirt, heat, fumes, vapor, or moisture of such degree as is declared by the enforcing authority to require the same.

4. Two-compartment lockers should be provided in a separate room from the place of work for employees whose clothes are exposed to contamination with poisonous, infectious, or irritating material, and well separated facilities should be provided for street and working clothes.

5. Where the process in which the worker is engaged is such that his working clothes may become wet or have to be washed between shifts, they should be so cared for that dry clothes are assured for the return to work.

6. Adequate provision for drying outdoor clothing, if wet, should be made.

7. Where less than 10 women are employed and a retiring room is not furnished, some equivalent space should be provided which can be screened properly and made suitable for the use of women employees.

8. The minimum space provided for a retiring room for 10 women should be 60 sq. ft. The minimum increased space for more should be at least 2 sq. ft. for each additional woman employed.

9. At least one couch or bed should be provided in every place where more than 10 women are employed. The number of such beds or couches required should be as follows: 10 to 100 women, 1 bed; 100 to 250 women, 2 beds; and 1 additional bed for each additional 250 women employed.

10. The walls and partitions of every retiring room should be of solid construction and should be at least 7′ high. Glass of approved translucence may be inserted in such walls or partitions. Every retiring room should be so constructed and maintained that privacy may be secured at all times and should be provided with locker or separate clothes hook for every female employee, unless such facilities are elsewhere provided.

11. In every establishment a separate lunch room should be maintained unless it is convenient for the employees to lunch away from the premises. Table 3 gives the number of square feet per person, based on the maximum number of persons using the room at one time, which should be required.

TABLE 3

Lunch Room Areas Recommended

Persons	*Square Feet per Person*
Less than 25	8
25– 74	7
75–149	6
150–499	5
500 and more	4

12. All factories, workshops, and other places of employment should allow all employees at least ½ hour for their midday meal, after being continuously employed for a period of not more than 5 hours on any work day, except Saturday.

13. Notice of the hours within which employees may partake of such meals should be plainly printed and kept posted at a conspicuous place in all workrooms where employees are engaged.

14. No employees should be allowed to eat lunch at their place of work, or in the workroom.

15. All water closet compartments, all toilet rooms, all wash, dressing, and retiring rooms, all privies, and the floors, walls, ceilings, and surfaces thereof, and all fixtures therein, should at all times be kept and maintained in good repair and in clean, odorless, and sanitary condition. They should also be screened.

16. The enclosure of all toilet rooms, dressing rooms, or water closet compartments, and all fixtures should be kept free from all indecent writing or marking, and such defacement, when found, should at once be removed by the employer.

17. A covered receptacle should be provided for disposing of all waste food, and employees should use the same for the disposal of all such materials.

HOUSEKEEPING

1. All places of employment, passageways, storerooms, and service rooms should be kept in a sanitary condition.

2. The roof, passages, stairs, halls, basements, cellars, privies, water closets, cesspools, drains, and all the premises thereof, should at all times be kept in a clean, safe, and sanitary condition.

3. Every establishment and the premises thereof and the yards, courts, passages, areas, or alleys connected with or belonging to the same should be kept free from any accumulation of dirt, filth, rubbish, or garbage.

4. The floor of every workroom should be maintained in a clean, and, as far as possible, dry condition. Where wet processes are used, reasonable drainage should be maintained and false floors, platforms, mats, or other dry standing places should be provided. The employer should, without expense to the employee, furnish proper boots or shoes for the use of the employee while at work in such places.

5. Floors and other walk-way surfaces should be kept in good repair, free from accumulations of oil and water. All dangerous projections from walk-ways should be eliminated.

6. So far as is practicable, sweeping and cleaning should be done outside of working hours and in such manner as to avoid the dissemination of dust.

7. Every floor, working place, and passageway should be kept free from protruding nails, splinters, holes, and loose boards.

8. Expectorating upon the walls, floors, work places, or stairs of any establishment covered by these recommendations should be prohibited.

9. Cuspidors, if used, should be of such construction that they can be kept clean and disinfected; they should be cleaned daily to prevent them from becoming a menace to health.

10. Whenever a receptacle is used for waste or refuse which is liquid or liable to decompose, it should be so constructed that it does not leak, and may be conveniently and thoroughly cleaned, and it should be maintained in a sanitary condition.

11. All sweepings, waste, refuse, and garbage should be removed as often as necessary to maintain the place of employment in a sanitary condition.

12. Wherever mechanical or chemical equipment is used to maintain sanitation, periodic inspection should be required to assure the efficiency of such equipment and record made of every inspection.

13. Lighting fixtures should be cleaned often enough to keep the intensity of illumination above the prescribed minimum values. Where dependence is placed on daylight, windows should be kept clean enough to fulfil their purpose.

14. Materials should be piled so that they will not easily fall, or be displaced by vibration or jolts.

15. Discarded material of an inflammable nature should be placed in self-closing metal containers which should be emptied at least once daily.

16. Flammable material should not be stored under stairways.

17. Fire extinguishers should be kept in operable condition, and protected from freezing. If of the soda-acid type they should be recharged at least once a year.

18. Industrial wastes should be treated by approved methods before being dumped into streams.

ENVIRONMENTAL PRINCIPLES

Under the environmental principles are included matters pertaining to space allotment, the control of air temperatures (heating and cooling), the provision of adequate ventilation and illumination, and the elimination and disposal of air-borne contaminants. These items bear directly upon the occupational diseases which, together with the medical principles in another section, form the main part of industrial hygiene. The problems coming within the scope of the environmental principles are numerous and often com-

plex. This treatment can, however, follow a pattern that is easily generalized for the purpose of discussion.

SPACE NEEDS

1. The cubic space of workrooms should be such as to afford, without deduction for benches, machines, furniture, and material, at least 400 cu. ft. per worker.

2. The cubic space for offices should be such as to afford, without deduction for benches, furniture, and material, at least 250 cu. ft. per person.

TEMPERATURE CONTROL

1. Except when outside temperatures exceed 75° F., or where air conditioning is used, or where the work is strenuous, or where the nature of the work requires special temperatures and humidities, the air temperature in all work rooms to which these principles apply should be in accordance with the list of desirable temperatures given in Table 4.

TABLE 4

Desirable Dry Bulb Temperatures for Various Humidities

Relative Humidity (Per cent)	*Desirable Temperatures * (Deg. F.)*
30	72–78
40	71–77
50	70–76
60	69–75
70	68–74

* Based on the comfort zone for winter and summer conditions, chapter 3, *Guide*, American Society of Heating and Ventilating Engineers, 14th ed., 1936.

2. The temperature requirements given in Table 4 may be disregarded in industries having extensive radiant energy sources, such as foundries, steel mills, etc.

3. Where cool air douches are used, the temperature of the effluent air should not be less than 72° F. All cool air douches should be capable of regulation by adjustable dampers and sufficiently flexible to permit the air flow to be directed effectively toward any point at which work is done, unless such douches are distributed so as to be effective over the whole area in which the work is done.

4. In permanent places of employment where it is not possible to maintain temperatures below 95° F., consideration should be given to the advisability of limiting the hours of work and allowing frequent rest periods in a normal environment.

5. Salt tablets should be made available in all environments conducive to the development of heat exhaustion or heat cramps, at no expense to the employee.

VENTILATION REQUIREMENTS

Good and sufficient ventilation, and healthful temperature and humidity conditions should be provided and maintained in every manufacturing establishment, factory, or workshop, for every workroom thereof, and for all allied service rooms in connection therewith (such as office, stock, sorting, shipping, wash, dressing, locker, and toilet rooms), at all times during working hours. No mechanical ventilation system is needed at any place of employment that is constructed with partly open walls or in buildings used for refrigeration.

1. *Natural ventilation*—Windows and other glazed openings should be so constructed as to permit a minimum operable area in accordance with the requirements in Table 5.

TABLE 5

Minimum Operable Window Requirements for Natural Ventilation

Space	*Per cent of Floor Area Served*
Workrooms	8
Offices	8
Eating places and kitchens	8
General store rooms	2
Locker rooms	5
Toilet rooms	5

Every skylight should be so constructed and maintained as to be opened at least one-half of its required area.

2. *Mechanical ventilation*—Where mechanical ventilation is used the system should be designed and constructed, in accordance with generally accepted good practice, to provide the necessary changes of air, but in no case less than suggested by this section.

a. The air supplied by a mechanical system of ventilation should be from an uncontaminated source, free of any injurious substances.

b. If the air supply to any building is contaminated with substances in concentrations exceeding the allowable safe limits, filters, absorbers, air washers, or other approved appliances should be provided to eliminate these impurities.

c. The distribution of the fresh air supplied should be so arranged as to maintain the temperature requirements without un-

comfortable drafts or any direct draft lower than 65° F. in occupied spaces.

d. Any heat source which does not contaminate the air, and which does not conflict with requirements of fire, building, or electrical codes, may be used to warm the air supplied for ventilation, or to provide heat by direct radiation, or both.

e. Offices with less than 25 sq. ft. of floor space per occupant should be provided with at least 15 cu. ft. of air per min. per person. Where the space allotment is in excess of 25 sq. ft., 12 cu. ft. per min. per person should be provided.

f. Workrooms in which the work performed is sedentary, and in which the space allotment is less than 25 sq. ft. of floor area per person, should be provided with at least 20 cu. ft. per min. per person. Space allotment in excess of 25 sq. ft. of floor area should be provided with 15 cu. ft. per min. per person.

g. Workrooms in which the work performed is arduous should be provided with at least 30 cu. ft. per min. per person.

h. Exceptions to (f) and (g) may be permitted when the net free space per worker exceeds 1,000 cu. ft. The ventilation requirements in such instances may be reduced 50 per cent.

i. Kitchens handling food for employees should be provided with at least 8 air changes per hr.

j. Lavatories, toilet rooms, bathrooms, and rest rooms should be provided with at least 4 air changes per hr.

k. Garages should be provided with at least 7,500 cu. ft. of air per min., for every car estimated to be in operation at a given time, and in any case not less than 4 air changes per hr. except in rooms where cars are stored for periods in excess of 1 week, or where special local exhaust is provided, then this requirement is reduced to 3 changes per hr.

TABLE 6

Recirculation Requirements for Various Occupied Spaces

Space	*Amount Air Recirculation Permitted (Per cent)*
Kitchens	None
Lavatories, toilet rooms, bathrooms, and rest rooms	None
Laboratories	None
Workrooms	75*
Restaurants and dining halls	50

* Provided the air is free from harmful dusts, fumes, vapors, and gases.

l. Automobile repair shops should be provided with at least 4 air changes per hr., except where the exhaust of each car is connected to an approved exhaust system, when this requirement may be reduced to 3 air changes per hr.

3. *Recirculation* — Where recirculation is practised it should comply with the requirements given in Table 6.

4. *Miscellaneous* — The following requirements should also be adhered to:

a. The disposal of all matter eliminated by exhaust systems should be so managed as not to endanger the health of any person about the premises or elsewhere in the community.

b. Every main pipe of an exhaust system, both suction and discharge, should be provided with clean-out doors so spaced as to allow the pipe to be thoroughly cleaned.

c. Every pipe should be kept open and unobstructed throughout its length, and no fixed screen may be placed in it. The use of a trap at the junction of the hood and branch pipe is recommended, provided it is not allowed to fill up with dust.

d. Every exhaust system should at all times be kept in good repair and clean condition, and operated in conformity with these rules, while the machinery for which it is provided is in use.

e. Whenever an air duct passes through a firewall, it should be arranged so as to comply with the requirements of the *Building Code* recommended by the National Board of Fire Underwriters, 5th ed., 1934.

f. All duct systems handling organic dust or any easily oxidized substance should be carefully grounded to avoid explosion.

g. In all places of employment where injurious amounts of dusts, fumes, gases, or vapors are liberated into the atmosphere, approved exhaust systems should be installed, maintained in good condition, and effectually operated at all times.

h. The fresh air supplied to replace the air removed by exhaust ventilation should be considered as fresh air in the calculation of the requirements in paragraphs 2(f) and 2(g) above, provided that the air supplied is from an approved source. This provision also applies to cool air douches.

i. Sufficient fresh air should be supplied to all workrooms equipped with exhaust systems to replace all air which is removed. Air supply openings should be so spaced as to give a uniform movement of air throughout the workroom, and produce no drafts.

LIGHTING REQUIREMENTS

1. *Natural illumination*—(a) Every window required by these principles should open directly on a street or other approved open space, or on a court or yard.

(b) Windows and other glass openings for illumination should be constructed in accordance with the requirements given in Table 7.

TABLE 7

Minimum Window Area Requirements for Natural Illumination

Space	*Per cent of Floor Area Served*
Workrooms	30
Offices	15
Eating places and kitchens	15
General storage rooms	3
Basements and cellars	3
Locker rooms	10
Toilet rooms	10

Skylights should have glass areas not less than required for the windows they replace. They should be arranged with the sides extended above the roof and there provided with hinged glazed sash and metal sash openers, having a combined area not less than would be required for openable parts in windows in such locations, or the skylight may be arranged with fixed metal louvred sides of required opening, and a pivoted glazed sash should be provided at the ceiling line of the room.

2. *Artificial illumination*—(a) The requirements for artificial lighting of any work place or process should not be less than the minimum specified in Table 8.* For workrooms and processes not specifically mentioned, the illumination should be at least 5 foot candles. The degree of illumination should be increased wherever detailed work is carried on.

b. Lamp reflectors or other accessories, as well as mounting height and spacing, should be such as to secure a reasonably uniform distribution of illumination, avoiding objectionable shadows, sharp contrasts or brightness, and glare.

c. Bare light sources, located within the field of the worker's vision, should not be used.

d. Emergency lighting should be provided in all work space, aisles, stairways, passageways, exits, and on all fire escapes. Emergency lighting systems, including all supply and branch lines, should be entirely independent of the regular lighting system and should be concurrently in operation with the regular lighting.

e. The lighting provided in all stairways, passageways, and exits of factories should be protected from failure by an independent connection extending back to the main service entrance for the building. In case of unusual danger, which may exist on account of the type of building, nature of the work, crowded conditions, or lack of suitable exit space, an independent service should be insured by connection with a separate source of supply without or within the building.

ENGINEERING CONTROL PRINCIPLES

There are several methods available for protecting workers from exposure to dust, gases, fumes, vapors, and mists. Briefly these are: (a) Personal protection devices, including masks, respirators, and protective clothing, (b) isolation or segregation of hazardous sources, (c) the use of local exhaust ventilation, and (d) the application of wet methods (for dusts). In addition may be mentioned the substitution of noninjurious substances, such as, for example, the use of metal shot instead of sand for abrasive cleaning. Combinations of the various methods mentioned may also be considered as being included in this section. Sampling methods have been included because the effectiveness of any system of control is dependent upon the results of representative samples.

PERSONAL PROTECTION

1. Where exhaust methods or other methods are not sufficient to control dust, gas, fume, vapor, or mist hazards, or other places where there is likely to be danger from unknown gases, fumes, or vapors, workers should be provided with respirators or other respiratory protective equipment approved by the U. S. Bureau of Mines.

2. No worker should be permitted to enter a tank or any closed space where there is likely to be any gas or vapor, unless he is provided with protective respiratory equipment approved by the U. S. Bureau of Mines for this purpose. Such workers should also be provided with a safety rope, which is held slightly taut by a second worker outside the danger zone.

* The requirements given in Table 8 are open to some criticism since there is no general agreement as to what constitutes adequate lighting.

TABLE 8

Minimum Operating Foot Candles—Measured on the Work *

Aisles, Stairways, Passageways	5
Assembly:	
Rough	10
Medium	20
Fine	B*
Extra Fine	A*
Automobile Manufacturing:	
Assembly Line	B*
Frame Assembly	15
Body Manufacturing—	
Parts	20
Assembly	20
Finishing and Inspecting	A*
Bakeries	20
Book Binding:	
Folding, Assembling, Pasting, etc.	10
Cutting, Punching and Stitching	20
Embossing	20
Candy Making:	
Box Department	20
Chocolate Department—	
Husking, Winnowing, Fat Extraction, Crushing and Refining, Feeding	10
Bean Cleaning and Sorting, Dipping, Packing, Wrapping	20
Milling	C*
Cream Making—	
Mixing, Cooking and Molding	20
Gum Drops and Jellied Forms	20
Hand Decorating	C*
Hard Candy—	
Mixing, Cooking and Molding	20
Die Cutting and Sorting	C*
Kiss Making and Wrapping	C*
Canning and Preserving	20
Chemical Works:	
Hand Furnaces, Boiling Tanks, Stationary Driers, Stationary and Gravity Crystallizers	5
Mechanical Furnaces, Generators and Stills, Mechanical Driers, Evaporators, Filtration, Mechanical Crystallizers, Bleaching	10
Tanks for Cooking, Extractors, Percolators, Nitrators, Electrolytic Cells	15
Clay Products and Cements:	
Grinding, Filter Presses, Kiln Rooms	5
Molding, Pressing, Cleaning and Trimming	10
Enameling	15
Color and Glazing	20
Cleaning and Pressing Industry:	
Checking and Sorting	20
Dry and Wet Cleaning and Steaming	10
Inspection and Spotting	A*
Pressing	
Machine	20
Hand	C*
Receiving and Shipping	10
Repair and Alteration	C*
Cloth Products:	
Cutting, Inspecting, Sewing—	
Light Goods	20
Dark Goods	A*
Pressing, Cloth Treating (Oil Cloth, etc.)	
Light Goods	10
Dark Goods	20
Dairy Products	20
Elevators — Freight and Passenger	10
Engraving	A
Forge Shops and Welding	10
Garages—Automobile:	
Storage—Live	10
" Dead	2
Repair Department and Washing	C*
Glass Works:	
Mix and Furnace Rooms, Pressing and Lehr, Glass Blowing Machines	10
Grinding, Cutting Glass to Size, Silvering	20
Fine Grinding, Polishing, Beveling, Etching and Decorating	C* D*
Inspection	B* D*
Glove Manufacturing:	
Light Goods—	
Pressing, Knitting, Sorting	10
Cutting, Stitching, Trimming and Inspecting	20
Dark Goods—	
Cutting, Pressing, Knitting, Sorting	20
Stitching, Trimming and Inspection	A*
Hat Manufacturing:	
Dyeing, Stiffening, Braiding, Cleaning and Refining—	
Light	10
Dark	20
Forming, Sizing, Pouncing, Flanging, Finishing and Ironing—	
Light	15
Dark	30
Sewing—	
Light	20
Dark	A*
Ice Making—Engine and Compressor Room	10
Inspection:	
Rough	10
Medium	20
Fine	B*
Extra Fine	A*
Jewelry and Watch Manufacturing	A*
Laundries	20
Leather Manufacturing:†	
Leather Working:†	
Locker Rooms	5
Machine Shops:	
Rough Bench and Machine Work	10
Medium Bench and Machine Work, Ordinary Automatic Machines, Rough Grinding, Medium Buffing and Polishing	20
Fine Bench and Machine Work, Fine Automatic Machines, Medium Grinding, Fine Buffing and Polishing	B*
Extra Fine Bench and Machine Work, Grinding—	
Fine Work	A*
Meat Packing:	
Slaughtering	10
Cleaning, Cutting, Cooking, Grinding, Canning, Packing	20
Offices:	
Bookkeeping, Typing and Accounting	30
Business Machines — Power Driven (Transcribing and Tabulating)—	
Calculators, Key Punch, Bookkeeping	B*
Conference Room—	
General Meetings	10
Office Activities—	
See Desk Work	
Corridors and Stairways	5
Desk Work—	
Intermittent Reading and Writing	20
Prolonged Close Work, Computing, Studying, Designing, etc.	C*
Reading Blueprints and Plans	30
Drafting—	
Prolonged Close Work— Art Drafting and Designing in Detail	C*
Rough Drawing and Sketching	30
Filing and Index References	20

* See reference footnote at end of table.

† An I. E. S. research study of lighting in this industry is now in progress.

TABLE 8—(Cont.)

Offices: (Cont.)	
Lobby	10
Mail Sorting	20
Reception Rooms	10
Stenographic Work Prolonged Reading Shorthand Notes	C*
Vault	10
Packing and Boxing	10
Paint Mixing	10
Paint Shops:	
Dipping, Simple Spraying, Firing	10
Rubbing, Ordinary Hand Painting and Finishing; Art, Stencil and Special Spraying	20
Fine Hand Painting and Finishing	B*
Extra Fine Hand Painting and Finishing (Automobile Bodies, Piano Cases, etc.)	A*
Paper Box Manufacturing:	
Light	10
Dark	20
Storage	5
Paper Manufacturing:	
Beaters, Grinding, Calendering	10
Finishing, Cutting, Trimming, Paper Making Machines	20
Plating	10
Polishing and Burnishing	15
Power Plants, Engine Room, Boilers:	
Boilers, Coal and Ash Handling, Storage Battery Rooms	5
Auxiliary Equipment, Oil Switches and Transformers	10
Engines, Generators, Blowers, Compressors	15
Switchboards	C
Printing Industries:	
Type Foundries:	
Matrix Making, Dressing Type	A*
Font Assembly — Sorting	B*
Hand Casting	C*
Machine Casting	20
Printing Plants:	
Presses	C*
Imposing Stones	A* D*
Proof Reading	A*
Photography:	
Dry Plate and Film	2000
Wet Plate	3000
Printing on Metal	2000
Printing Industries: (Cont.)	
Electrotyping:	
Molding, Finishing, Leveling Molds, Routing, Trimming	B*
Blocking, Tinning	C*
Electroplating, Washing, Backing	20
Photo Engraving:	
Etching, Staging	20
Blocking	C*
Routing, Finishing, Proofing	B*
Tint Laying	A*
Receiving and Shipping	10
Rubber Manufacturing and Products:†	
Sheet Metal Works:	
Miscellaneous Machines, Ordinary Bench Work	15
Punches, Presses, Shears, Stamps, Welders, Spinning, Medium Bench Work	20 D*
Tin Plate Inspection	B* D*
Shoe Manufacturing (Leather):	
Cutting and Stitching—	
Cutting Tables	10
Marking, Buttonholing, Skiving, Sorting, Vamping, and Counting—	
Light Materials	20
Dark Materials	C*
Stitching—	
Light Materials	C*
Dark Materials	B*
Making and Finishing—	
Stitchers, Nailers, Sole Layers, Welt Beaters and Scarfers, Trimmers, Welters, Lasters, Edge Setters, Sluggers, Randers, Wheelers, Treers, Cleaning, Spraying, Buffing, Polishing, Embossing—	
Light Materials	20
Dark Materials	C*
Storage, Packing and Shipping	10
Shoe Manufacturing (Rubber):	
Washing, Coating, Mill Run Compounding	10
Varnishing, Vulcanizing, Calendering, Upper and Sole Cutting	C*
Sole Rolling, Lining, Making and Finishing Processes	C*
Soap Manufacturing:	
Kettle Houses, Cutting, Soap Chips and Powder	10
Stamping, Wrapping and Packing, Filling and Packing Soap Powder	20
Steel and Iron Manufacturing:	
Billet, Blooming, Sheet Bar, Skelp and Slabbing Mills	5
Boiler Room, Power House, Foundry and Furnace Rooms	5
Hot Sheet and Hot Strip Mills	10
Cold Strip, Pipe, Rail, Rod, Tube, Universal Plate and Wire Drawing	10**
Merchant and Sheared Plate Mills	15*
Tin Plate Mills—	
Hot Strip Rolling and Tinning Machine Dept.	10
Cold Strip Rolling	15
Inspection—	
Black Plate	C*
Bloom and Billet Chipping	C*
Tin Plate and Other Bright Surfaces	B* D*
Machine Shops and Maintenance Department	
Repair Shops—	
Rough Bench and Machine Work	10
Medium Bench and Machine Work	20
Fine Work — Buffing, Polishing, etc.	B*
Extra Fine Work	A*
Blacksmith Shop	10
Laboratories (Chemical and Physical)	15
Carpenter and Pattern Shop	20
Storage	2
Stone Crushing and Screening:	
Belt Conveyor Tubes, Main Line Shafting Spaces, Chute Rooms, Inside of Bins	5
Primary Breaker Room, Auxiliary Breakers under Bins	5
Screens	10
Storage Battery Manufacturing:	
Molding of Grids	10
Store and Stock Rooms:	
Rough Bulky Material	5
Medium or Fine Material Requiring Care	10
Structural Steel Fabrication:	10
Sugar Grading	30
Testing:	
Rough	10
Fine	20
Extra Fine Instruments, Scales, etc.	A*

* See reference footnote at end of table.

† An I. E. S. research study of lighting in this industry is now in progress.

TABLE 8—(Cont.)

Textile Mills (Cotton):	
Opening, Mixing, Picking, Carding and Drawing...	10
Slubbing, Roving, Spinning	20
Spooling, Warping on Comb	20
Beaming, and Slashing on Comb—	
Grey Goods	20
Denims	B*
Inspection—	
Grey Goods (Hand Turning)	C*
Denims (Rapidly Moving)	A*
Automatic Tying-In, Weaving	B*
Drawing-In by Hand.....	A*
Silk and Rayon Manufacturing:	
Soaking, Fugitive Tinting, and Conditioning or Setting of Twist.....	10
Winding, Twisting, Rewinding, and Coning, Quilling, Slashing	30
Silk and Rayon (Cont.)	
Warping (Silk or Cotton System)	
On Creel, on Running Ends, on Reel, on Beam, on Warp at Beaming	C*
Drawing-In—	
On Heddles	A*
On Reed	A*
Weaving—	
On Heddles and Reeds..	5
On Warp Back of Harness	10
On Woven Cloth.....	30
Woolen:	
Carding, Picking, Washing, Combing	10
Twisting, Dyeing	10
Drawing-In, Warping—	
Light Goods	15
Dark Goods	30
Weaving—	
Light Goods	15
Dark Goods	30
Knitting Machines	20
Tobacco Products:	
Drying, Stripping, General	10
Grading and Sorting.....	A*
Toilets and Wash Rooms	5
Upholstering—Automobile, Coach Furniture	20
Warehouse	5
Woodworking:	
Rough Sawing and Bench Work	10
Sizing, Planing, Rough Sanding, Medium Machine and Bench Work, Gluing, Veneering, Cooperage ..	20
Fine Bench and Machine Work, Fine Sanding and Finishing	C*

** In these areas many of the machines require one or more supplementary lighting units mounted on them in order effectively to direct light toward the working points.

* Lighting recommendations for the more difficult seeing tasks, as indicated by A, B, C and D in the foregoing table, are given in the following:

Group A:

These seeing tasks involve (a) the discrimination of extremely fine detail under conditions of (b) extremely poor contrast, (c) for long periods of time. To meet these requirements, illumination levels above 100 foot candles are recommended.

To provide illumination of this order a combination of at least 20 foot candles of general lighting plus specialized supplementary lighting is necessary. The design and installation of the combination systems must not only provide a sufficient amount of light but also must provide the proper direction of light, diffusion, eye protection, and in so far as possible must eliminate direct and reflected glare as well as objectionable shadows.

Group B:

This group of visual tasks involves (a) the discrimination of fine detail under conditions of (b) a fair degree of contrast (c) for long periods of time. Illumination levels from 50 to 100 foot candles are required.

To provide illumination of this order a combination of 10 to 20 foot candles of general lighting plus specialized supplementary lighting is necessary. The design and installation of the combination systems must not only provide a sufficient amount of light but also must provide the proper direction of light diffusion, eye protection, and in so far as possible must eliminate direct and reflected glare as well as objectionable shadows.

Group C:

The seeing tasks in this group involve (a) the discrimination of moderately fine detail under conditions of (b) better than average contrast (c) for intermittent periods of time.

The level of illumination required is of the order of 30 to 50 foot candles and in some instances it may be provided from a general lighting system. Oftentimes, however, it will be found more economical and yet equally satisfactory to provide from 10 to 20 foot candles from the general system and the remainder from specialized supplementary lighting. The design and installation of the combination systems must not only provide a sufficient amount of light but also must provide the proper direction of light, diffusion, eye protection, and in so far as possible must eliminate direct and reflected glare as well as objectionable shadows.

Group D:

The seeing tasks of this group require the discrimination of fine detail by utilizing (a) the reflected image of a luminous area or (b) the transmitted light from a luminous area.

The essential requirements are (1) that the luminous area shall be large enough to cover the surface which is being inspected and (2) that the brightness be within the limits necessary to obtain comfortable contrast conditions. This involves the use of sources of large area and relatively low brightness in which the source of brightness is the principal factor rather than the foot candles produced at a given point.

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3. Where practicable, dry standing room should be provided for employees. Where employees are required to do work outside of their usual duties in which it is not possible to provide dry standing room, they should be furnished, when practicable, suitable waterproof footwear.

4. Workers should be instructed in the use of and the necessity of using the personal protective equipment, and employers should take steps to require the employees to use such equipment.

5. Masks and respirators should not be used in lieu of exhaust ventilation or other methods for controlling dust, gas, fume, vapor, or mist hazards.

6. Suitable types of protective clothing in good condition should be furnished to workers exposed to injury hazards from physical contact with materials, such as goggles for protection against flying objects or metal splashes, safety hats or helmets, and safety shoes for protection against falling objects, fire-resisting leggings for protection against molten metal, leather or asbestos aprons for protection against sharp edges, splinters, or electric shocks, etc.

7. Wherever the nature of the work is such that the employees' clothing becomes covered with or permeated with industrial poisons, the employer should provide necessary equipment and help to cleanse such clothing as often as may be necessary.

CONTROL OF DUSTS, FUMES, VAPORS AND GASES

1. Every source of air contaminant should be controlled by one or more of the following methods:

   a. Segregation or isolation of source
   b. The use of local exhaust ventilation
   c. Wet methods (for dust control)

2. Wherever a substance producing contamination can be replaced by a less hazardous material without increasing the degree of air contamination or interfering with the manufacturing process, replacement should be made.

3. When a process giving rise to atmospheric contamination can be altered or substituted by another which either eliminates the contamination or reduces its extent, consideration should be given to such alterations or substitutions.

4. All control equipment should be inspected at regular intervals and any defects noted should be repaired immediately.

5. A periodic check upon the performance of control equipment should be made by means of air samples taken by an approved technic.

SAMPLING

1. Samples should be taken wherever there is a known or suspected source of air contamination.

2. Samples should be taken at the breathing level of the workers exposed, special emphasis being given to the locations nearest the source and those in the path of air currents carrying the gas.

3. Before entering any space not frequently used, and suspected of containing a noxious gas or vapor, air samples should be taken to determine the amount present.

4. Samples should be taken at sufficient intervals of time so that any variations in concentration will be evident.

5. When an automatic recording device is used, it should be operated continuously during the working period.

6. When indicators are used, half-hour readings during the working period should be taken.

7. When vacuum flasks or liquid displacement methods are used for sampling gases or vapors, samples should be taken at half-hour intervals during the working period.

8. Samples should be taken in sufficient number to avoid any reasonable doubt of the results found.

9. If only one sampling point is deemed necessary, the samples should be taken in triplicate. If numerous locations are to be sampled, representative points may be selected among them.

10. Indicators and recorders should be operated in accordance with the directions furnished by the manufacturer.

11. If samples are taken of any occupation entailing a variety of activities, careful time studies should be made, and samples taken representative of each activity. The exposure determined should be weighted in accordance with the time spent in each activity.

12. Whenever possible, samples should be taken by recognized technics by trained personnel.

PRINCIPLES RELATING TO RECORDS AND POSTING OF NOTICES

The keeping of records and posting of notices must be regarded as much a part of industrial hygiene as many of the requirements previously listed. Not only do records measure progress in the control of specific hazards, but also if such items as labor turnover, injuries received, or illnesses treated, to men-

tion a few, are available for analysis, they may often reveal significant facts pertaining to unsuspected hazards. Posters when properly prepared and displayed are valuable adjuncts for the education of employees in matters of personal hygiene and accident prevention.

KEEPING RECORDS

1. Every employer should keep a record of all major changes in the plant which in any way may affect the environment of the employee.

2. Every 6 months a tabulation of the labor turnover by department should be made and recorded on standard forms.

3. Every employer should keep a record on standard forms of all injuries which cause death or disability or require medical attention or first aid treatments received by employees in the course of their employment.

4. Within 10 days after the occurrence and knowledge of such injury, a report should be made to a responsible person and be used for analysis of causes and prevention of similar injuries.

5. Upon termination of a disability or illness, or if a disability or illness extends beyond a period of 30 days, a supplementary report should be made to a responsible person.

6. All absences taken for 1 day or more on account of injury or illness should be recorded by the foreman and referred to a responsible person. A report of every absence due to injury or illness should be made on a form provided for the purpose.

POSTING NOTICES

1. Every industrial establishment should provide one or more bulletin boards for posting notices located so as to attract the attention of every employee at some time during the working day.

2. All employees should be instructed in the hazards incidental to the work engaged in, both with regard to the individual and fellow workers. Workers who are transferred to other unaccustomed work should be instructed as to the hazards incidental to the new occupation.

3. The employer should place warning signs and instruct all employees who are required to work where industrial poisons of a hazardous nature are used, stored, or carried, regarding the danger connected with them.

CONCLUSIONS

The principles given above are not to be construed as constituting a code. They are chiefly intended to indicate the scope of industrial hygiene. It is evident, however, that the principles may form the basis for developing codes or regulations. Codes are regulatory, and are subject to enforcement. For this reason, the principles as worded in this paper are in many instances impractical, and if accepted as they stand even with the substitution of the word "shall" for "should," may lead to much confusion. A principle may express a desirable objective, but if it cannot be enforced it has no place in a code.

The field of industrial hygiene is specialized to a certain degree, but it is definitely a part of public health administration. Of late years, there has been a tendency, particularly among engineers, to regard industrial hygiene as a definite profession, distinct say from sanitary or public health engineering. This tendency is to be deplored. It arises from present-day university curricula in the last two fields mentioned. A close study of the principles demonstrates clearly that industrial hygiene is precisely sanitary or public health engineering as we understand them, with a special emphasis on the industrial environment. There is no apparent reason why instruction in air sanitation and industrial poisons should not form a part of sanitary or public health engineering in our universities. In fact, sanitation and industrial hygiene engineering could be merged into the profession of public health engineering. Otherwise, the constant subdivision of engineering into specialized domains will mitigate against the best interests of all concerned.

Finally, with regard to the medical and engineering aspects of the basic principles, one more fact must be

stressed. Industrial hygiene offers a method of attacking general problems of public health administration. Because industrial hygiene establishes contact with a large section of our population, and keeps it under close observation, there is an opportunity to practise preventive medicine at a low cost to the community. Industrial hygiene should not be restricted to the control of occupational diseases. From the standpoint of public health it offers an opportunity to extend the treatment of venereal diseases as well as the determination and control of malnutrition, tuberculosis, and other diseases. If a worker is found to be suffering, say, from tuberculosis, not only are fellow workers protected by treating the individual but also the immediate family, because the discovery of such a case leads the health officer to consider the home environment. Thus, industrial hygiene simplifies the task of the public health administrator, who in the normal course of events must wait until the case comes to the attention of the family physician or a clinic. The opportunity to reach large sections of the population in this manner cannot be overemphasized. These are considerations which have been incorporated in the basic principles set down in this paper.

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Some Notes on Sanitary Land-fills*

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THE disposal of garbage, refuse, and ashes, by using them to fill in low or swampy areas, has been utilized by many municipalities throughout the world. As used in the past, this method of disposal grew into disfavor and was largely abandoned. E. J. Cleary [1] writes:

> A modernized version of refuse disposal on dumps, which minimizes the objectionable features heretofore associated with that method of handling waste, has been developed by the New York City Department of Sanitation. What recommends it for attention is its low cost and adaptability to many localities where refuse disposal is an expensive and troublesome problem.

The procedure for making a land-fill as described by Cleary is essentially as follows: Most of the sites selected for land-fills have been just above tide level and are covered with a dense growth of marsh vegetation. A drag line excavating machine digs a trench some 30 ft. in width, and 4 to 6 ft. in depth, ahead of the edge of the fill. This excavated material is later used for cover material. The trucks of mixed refuse are dumped on top of the completed parts of the refuse-fill, about 50 ft. from the edge of the fill which borders the trench. A Bulldozer then spreads the piled material by pushing it toward and over the edge into the trench, the Bulldozer compacting the fill as it moves back and forth over it. Load after load is dumped until the fill is built up to the desired level (usually about 12 ft. layers).

Part of the excavated material is spread over the exposed surface of refuse to cover it for a depth of 9 to 14 in. for the first cover. The deposited material is covered with an earth seal every second or third day. Later the final earth covering is placed with a minimum depth of 2 ft. of earth.

The land-fill method of disposal is frequently the cheapest, and often may pay returns in reclaimed land and improved conditions. It is still on an entirely empirical basis and has not been given a fraction of the scientific study bestowed upon all other methods of garbage and refuse disposal. Considering the possible economy and other possible advantages of the method, this oversight should be rectified. Little is known as to what goes on in a land-fill. The conditions and rates of decomposition, effect of mixtures, depth of fill, depth of soil cover, or character of soil cover, rate of settlement and consolidation of fill; their bearing power and drainage, and numerous other factors should be explored in an orderly and scientific fashion before it can be said with reason that the land-fill method is or is not economical, whether it is or is not a menace to health and safety; whether it can or cannot pro-

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duce advantageous results; and if it should be considered as an acceptable method of disposal, what limitations there may be and under what conditions it may properly be used.

To determine these and other factors, a coöperative WPA project has been organized with the Department of Sanitation of New York City as sponsor, and with the general direction of the work being under the Sanitary Engineering Division of the College of Engineering of New York University. The study is being made to answer three main questions:

1. What is the most efficient practice with respect to land-fill?
2. What are the possibilities of using garbage filled lands for structural purposes?
3. What are the physical and biological aspects of garbage decomposition?

Since February, 1939, experimentation has been going on in an attempt to explore these and other pertinent factors. Observations without conclusions will be offered in this paper because not enough work has been done from which to draw conclusions. Of necessity all remarks refer to conditions as they now exist in New York City.

COMPOSITION OF LAND-FILL MATERIAL IN NEW YORK CITY

The composition of the refuse as delivered to, and placed in, land-fills was determined by classifying truck-loads from selected geographical areas. The contents of a truck are dumped near land-filling operations and the refuse manually sorted, weighed, and volumetrically measured.

The results of classifying 107 truck-loads at two fills according to the percentage distribution by weight appears in Table 1. The results are based on the weights of material as received, irrespective of the moisture content. Truck-loads having minimum and maximum organic fraction (food refuse, paper, wood, rags, etc.) and the average analysis of 57 truck-loads at land-fill "A" and 50 truck-loads at land-fill "C" appearing in Table 1

TABLE 1

Composition of Mixed Refuse Delivered at Land-fills
Percentage Distribution by Weight

	Land-fill "A"			*Land-fill "C"*			*Average Fills "A" and "C"*
Classification	*Min. Organic*	*Max. Organic*	*Average*	*Min. Organic*	*Max. Organic*	*Average*	
Food refuse	0.61	34.16	9.04	2.65	8.55	4.87	6.93
Paper	16.27	45.51	24.68	7.46	26.26	11.41	17.96
Wood	4.18	1.39	3.33	0.55	2.04	0.57	1.94
Misc.*	3.03	6.80	3.64	0.29	0.90	0.92	2.26
Metal	6.77	5.51	6.84	2.48	6.70	4.11	5.37
Glass	24.03	6.01	5.23	1.62	4.35	3.03	4.13
Ashes	45.11	0.62	47.24	84.95	51.20	75.09	61.41
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Food refuse and paper	16.88	79.67	31.72	10.11	34.81	16.28	24.89
Food refuse, paper, wood and misc.*	24.09	87.86	38.69	10.95	37.75	17.77	29.09
	Percentage Distribution of Food Refuse Component						
Baked goods			13.6			12.5	13.3
Vegetables			25.4			28.1	26.4
Citrus			26.6			38.6	30.9
Greens			31.3			9.7	23.5
Meat			3.1			2.0	0.9
Misc.			...			9.1	5.0
Total			100.00			100.00	100.00

* Leather, linoleum, rags, leaves, grass, etc.

TABLE 2

Composition of Mixed Refuse Delivered at Land-fills
Percentage Distribution by Volume

Classification	Land-fill "A"			Land-fill "C"			Average Fills "A" and "C"
	Min. Organic	Max. Organic	Average	Min. Organic	Max. Organic	Average	
Food refuse	0.56	34.16	6.52	4.45	10.79	5.67	6.15
Paper	39.31	45.51	46.84	33.40	38.36	41.98	44.75
Wood	8.98	1.39	8.06	1.11	3.36	0.95	4.99
Misc.*	6.73	6.80	6.01	0.37	1.44	1.32	3.98
Metal	10.66	5.51	10.57	7.79	13.67	9.11	9.94
Glass	19.17	6.01	3.08	1.67	3.60	2.54	2.84
Ashes	14.59	0.62	18.92	51.21	28.78	38.43	27.35
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Food refuse and paper	39.87	79.67	53.36	37.85	49.15	47.65	50.90
Food refuse, paper, wood, and misc.*	55.58	87.86	77.43	39.33	53.95	49.82	59.90

* Leather, linoleum, rags, leaves, and grass.

show the degree of variation found and a comparison of the variation of garbage-refuse received at the two land-fill sites.

The volumetric distribution of materials found in 57 trucks delivered at land-fill "A" and 50 trucks delivered at land-fill "C" are given in Table 2.

Although wide variation is shown in both the weight and volumetric distribution of truck contents, the weighted average "organic fraction" of 107 trucks was found to be 29.09 per cent by weight and 59.9 by volume. The weighted average food refuse fraction was found to be 6.93 per cent by weight and 6.15 per cent by volume. The recognizable components of the garbage or food refuse fraction, also shown in Table 1, indicate their average distribution. A weighted average of 80.8 per cent of the food refuse is accounted for as vegetable and fruit waste.

These measurements were made during the late fall and winter.

PHYSICAL AND CHEMICAL ANALYSES

The physical analysis of sanitary land-fill material consisted of mechanically separating and classifying the coarse materials of definite composition. A chemical analysis was then made of materials of indefinite composition and source. Considering the heterogeneity of such material, the proper correlation of the data from various scientific, engineering, and public health aspects necessarily requires the analyses of a large number of samples in order that the results shall be representative.

Sampling Procedure—A coördinated grid of 100 ft. squares was established on each fill, and 8 in. diameter holes were dug at the corners of each 100 ft. square. Each hole was dug by spading off the top covering over an area 3 ft. in diameter before sinking a hole in the center of this circle. The material removed from the first 2 ft. depth from each of the 4 holes in a square was brought to an 8 ft. clean tarpaulin and composited. By the method of quartering, a composite sample was obtained, placed in a 1 gallon compression tin can, and transported to the laboratory.

Similar composite samples were likewise collected in 2 ft. strata at the middle and at the bottom of each fill. In one old fill having a total depth of 40 ft., 1 cu. ft. samples for compositing were readily obtained at every 5 ft. depth from the face of recent excavations.

Mechanical Classification of Samples—The composited gallon samples were weighed to the nearest gram, and spread out on a tray to an average depth of 1 in. and placed in a forced draft air drying oven and dried to constant weight. The air dried sample was now mechanically classified into mineral, metal, and wood constituents retained on both a 2 and 4 mesh screen. One to 2 lb. of the residual material which passed through the 4 mesh screen (or did not fall into the above classification) was taken by the method of quartering and sieved through a 14 mesh screen. All materials retained on this screen which proved to be other than coal, ashes, clinkers, metal, and stone were thoroughly macerated and combined with the material which passed through the screen. The resulting 14 mesh material was weighed and ground to pass a No. 40 screen before ignition of a 2 gm. sample to determine the volatile and fixed solids.

The weighed material passing 14 mesh screen (residue) was mechanically ground until it passed a 40 mesh screen. It was then stored pending chemical analysis. Determination of moisture in the air dry sample, volatile, solids or loss on ignition, and fixed solids were made on these samples.

In summary, the classification made is as follows: moisture; air dry No. 2 mesh mineral, metal, and wood solids; air dry No. 4 mesh mineral, metal, and wood solids; volatile and fixed solids of mineral (ashes) and coal retained on No. 14 mesh screen; and the moisture, volatile, fixed solids, etc., of "residue" which contained the dust, sand, silt, paper, leather, and other material not identified in the above classification.

Results—The results of 285 completed physical and chemical analyses are summarized in Table 3. The high quantity of relatively coarse mineral and ashes retained on 14 mesh screen remaining after a few months in a fill are of interest. These materials account for roughly one-half to two-thirds of the dry solids. The bulk of the remaining material is also relatively inert. Less than 5 per cent of the bulk dry solids (2.69 to 5.15 per cent volatile solids) in fill material over 4 months old are available for further microbiological decomposition. The residue volatile solids appear to indicate more rapid decomposition near the fill surface and continued decomposition after 4–8 months. The majority of microbial decomposition occurs during the first 4 months as indicated by the moisture corrected organic fraction of

TABLE 3

Physical and Chemical Analysis of Sanitary Land-fill
Grams of Solids in 100 Grams of Fill

Description	*Fill "C"*					*Fill "D"*		*Fill "E"*
Age of Fill →	*9–14 Months*			*4–8 Mos.*	*9–14 Mos.*	*1–12 Mos.*		*30–35 Yrs.*
Depth (feet)	0–2	3–7	8–14	0–14	0–14	2–4	6–12	0–40
No. Analysis	9	27	27	76	63	32	36	78
Moisture (per cent wet)	14.95	19.71	26.06	16.72	21.75	15.24	16.54	19.39
Mineral 2 mesh	8.42	5.26	5.88	7.03	5.96	5.37	4.91	6.19
Mineral 4 mesh	29.62	33.62	36.93	28.05	34.54	16.98	19.20	30.99
Metal 2 mesh	0.0	0.06	0.13	0.19	0.08	1.12	0.76	0.14
Metal 4 mesh	0.51	0.23	0.14	0.01	0.23	0.56	0.71	0.05
Wood 2 mesh	0.15	0.18	0.36	0.20	0.25	0.38	0.37	0.36
Volatile 14 mesh	3.28	2.86	2.62	2.87	2.82	3.42	3.46	3.63
Fixed 14 mesh	24.28	21.55	19.91	21.98	21.26	14.19	15.82	19.21
Residue moisture	0.38	0.42	0.48	0.37	0.43	0.36	0.30	1.22
Residue volatile	2.69	3.21	2.86	3.57	2.96	4.63	3.94	5.15
Residue fixed	29.58	31.12	27.73	34.54	29.32	52.36	49.93	31.92
Loss	1.09	1.50	2.96	1.22	2.15	0.63	0.60	1.12
Per cent volatile in residue	9.10	10.30	10.30	10.3	10.1	8.55	7.90	16.15

average truck contents (Tables 1 and 2).

Unfortunately the method selected does not differentiate between coal dust, stable organic matter, and unstable or undecomposed organic matter. Analyses are now under way on the above samples to differentiate these substances more effectively.

BACTERIOLOGICAL ANALYSIS OF LAND-FILL MATERIAL

The composited 1 gallon field samples were thoroughly mixed before diluting a 200 gm. "wet" weight to a fixed volume of 200 or 400 cc. Decimal geometric dilutions of this suspension were prepared and appropriate liquid or solid media were inoculated.

Choice of Analysis and Methods—The bacteriological analysis was limited to the determination of (a) *Escherichia coli,* (b) total coliform organisms, (c) "anaerobic lactose fermenters," (d) total plate count (37° C. for 24 hrs.), (e) total plate count (20° C. for 48 hrs.), and (f) thermophilic organisms.

Escherichia coli were determined on triplicate lactose broth tubes for each dilution, incubated at 37° C. Gas in 24 hours was considered positive, but positive gas formation during the second 24 hrs. was confirmed on eosin-methylene-blue agar plates. Only typical Escherichia colonies were noted and the density per gm. of land-fill recorded with the aid of McGrady's tables.

The total coliform density was determined by confirming the 24–48 hr. lactose broth positive gas tubes with brilliant green bile fermentation tubes according to *Standard Methods.* McGrady's tables gave the most probable density of organisms.

All positive gas lactose fermentation tubes after 48 hrs. incubation which did not confirm were used to enumerate the probable density of "anaerobic lactose fermenters." Obviously no value could be recorded if all positive gas tubes did confirm. It is further appreciated that the gas evolved in an unconfirmed presumptive test may not be due to anaerobic organisms in symbiosis with aerobic non-gas forming organisms.

Total plate counts on duplicate nutrient agar dishes per dilution were determined according to *Standard Methods of Water Analysis.*

Thermophilic organisms were determined in triplicate lactose broth fermentation tubes per dilution and incubated for 6 days at 58° C. Observation of gas, surface growth, and turbidity was made after 3 and 6 days.

Bacteriological Results of Land-fill Study—The results available are presented in Table 4 showing the minimum, maximum, and average density per gm. of "wet" land-fill material

TABLE 4

Bacteriological Analysis of Land-fill Material
Number of Organisms per Gram of Fill

	Minimum	*Maximum*	*Average*
Escherichia coli	0	500,000	333,000
Coliform	0	900,000	740,000
Anaerobic lactose fermenters	0	2,500,000	1,460,000
Total count (24 hr. 37° C.)	0.6×10^6	600×10^6	150×10^6
Total count (48 hr. 20° C.)	0.19×10^6	600×10^6	198×10^6
Thermophilic organisms			
3 day gas	0	90	10
6 day gas	0	25,000	1,360
3 day surface growth	0	40,000	3,080
6 day surface growth	0	190,000	13,200
3 day turbidity	0	90,000	10,700
6 day turbidity	0	190,000	23,600

TABLE 5

Natural Leachate Analysis

	Minimum	*Maximum*	*Average*
pH	5.7	8.4	6.9
T. Alkalinity p.p.m. ($CaCO_3$)	100.0	9,450.0	2,867.0
T. Acidity p.p.m. ($CaCO_3$)	25.0	4,000.0	1,089.0
Dis. Oxygen p.p.m.	0.0	5.6	1.2
B.O.D. 5 day p.p.m.	5.9	7,330.0	1,987.0
Chloride p.p.m.	280.0	12,300.0	2,406.0
Escherichia coli No./cc.	0.7	45,000.0	2,450.0
Total Count (24 hr. 37° C.) No./cc.	545.0	3,000,000.0	344,000.0

collected from several land-fills less than 2 years old. The 22 samples tested were collected from various depths below the top covering.

Natural Leachate Analysis—Upon boring holes to the bottom of a land-fill, a water table was encountered at various depths. This condition did not particularly interfere with the collection of field samples, but if the hole was not disturbed for 12 hrs., a sample of liquid leachings could be obtained. Twenty-eight such samples, uncontaminated by rains in the interim, were collected, and the unfiltered, settled liquid was tested according to methods outlined in *Standard Methods of Water Analysis*. The results of these natural leachate samples are summarized in Table 5.

In addition, 12 samples of fill drainage or stagnant bodies of water near the fill operation were tested. Maximum values for pertinent analyses are as follows: B.O.D. 5 day—170 p.p.m.; coliform organisms—9,500 per cc.; total count (24 hr. 37° C.)–33,000; NH_3–N–62 p.p.m.

GAS ANALYSIS

The study of the composition of gas found in sanitary land-fills was made to obtain information relative to: corrosion of structural material, fire hazard, the anaerobiosis of microbial decomposition, the possible accumulation of microbial waste products which might adversely affect the rate of stabilization, etc. These studies are made in the field with a portable gas analysis apparatus. Representative samples are withdrawn from different levels of the land-fill by means of capillary glass tubing inclosed in an iron pipe housing that is progressively driven into the land-fill as described elsewhere.[2]

Results obtained on a sanitary land-

TABLE 6

Composition of Gas in Land-fill "F"
Percentage Found in 2 Foot Level (A) and 2¼–4 Foot Level (B)

Sample No.	*Carbon Dioxide*		*Oxygen*		*Methane*		*Hydrogen*		*Nitrogen*	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*	*A*	*B*
51	1.0	2.0	10.0	4.0	0.0	0.0	0.0	0.0	89.0	94.0
70a	11.0	11.5	7.2	6.3	5.1	4.9	0.0	0.0	76.7	77.3
70b	12.3	10.4	3.0	4.8	0.0	0.0	0.0	0.0	84.7	84.4
71	16.4	17.0	0.6	1.0	0.0	1.7	0.0	0.0	83.0	81.3
70c	18.5	20.8	2.3	2.0	23.0	28.5	0.0	0.0	56.2	48.7
62	18.1	23.7	2.9	0.2	28.5	41.0	0.4	0.0	51.2	35.1
63	22.9	28.8	2.0	0.0	32.8	46.3	2.2	0.0	30.1	24.9
68	24.8	24.6	4.5	5.5	50.8	45.5	0.8	0.6	19.1	23.8
67	29.2	35.8	0.8	0.6	56.0	54.5	0.0	1.5	14.1	7.7
65	28.5	31.1	0.5	0.1	51.6	57.0	0.2	0.4	19.4	11.5
69	29.8	34.0	2.1	1.0	46.9	57.7	0.0	1.6	21.2	5.7
66	34.0	35.4	1.6	0.6	64.0	64.0	0.0	0.0	0.4	0.0
58	28.5	27.4	0.0	0.0	64.3	65.3	0.0	0.0	7.2	7.3
61	27.7	27.4	0.0	0.0	59.7	67.4	1.7	0.4	11.0	4.8
64	22.7	23.7	0.8	0.3	29.8	32.5	0.0	0.7	46.8	32.9

fill 2–4 years of age and having a water table less than 6 ft. below the covered surface are presented in Table 6. Except in a few instances the gas found at the 2 ft. level (just below the earth covering) had high carbon dioxide (10–35 per cent), high methane (20–65 per cent), traces of hydrogen and oxygen, and a variable nitrogen content (0.0–50 per cent). Almost invariably the gas found at lower levels (2½ to 4 ft.) was somewhat richer in carbon dioxide and methane.

Results obtained from a land-fill having no water table in the entire depth to 1 or 2 ft. from the bottom were highly variable. Typical average results at a location with little or no water submerged refuse and a well consolidated loam covering are presented in Table 7. Of particular significance is the relatively low methane content (1.7–6.6) and the high carbon dioxide content (22.2–33.9) both of which increased somewhat with depth. Apparently, depending on the type of covering, the quantity of water submerged refuse and the depth of sampling, the gases collected from this "dry" land-fill varied in composition from that of air to that indicated in Table 6.

Based on the composition of gas found in these two types of land-fill it is apparent that the type of microbiological activity differs in "wet" and "dry" land-fills.

TABLE 7

Composition of Gas in Land-fill "C"
Percentage by Volume

Depth in Feet	*Carbon Dioxide*	*Oxygen*	*Methane*	*Hydrogen*	*Nitrogen (by dif.)*
2	22.2	0.0	1.7	0.0	76.1
2	33.6	0.1	5.6	0.1	60.6
3	33.2	0.4	5.7	0.0	61.1
6	33.9	0.2	6.6	0.0	59.3

TEMPERATURES

Temperature measurements were made in two ways: (1) A series of 1¼ in. steel pipes were placed at different depths in the newly made land-fill as close to the face of the fill as possible. The temperature of a 6 in. plug of water at the bottom of each pipe was measured with a maximum thermometer. (2) A recording thermograph bulb was buried in the fill less than 5 hours old.

The first field temperatures were made on land-fill "A" and temperature measurements started 15 days after the placing of the fill. The temperature a day later was 119° F. at 3 ft. depth; 130° F. at 7 ft. depth; while the air temperature was about 75° F. The peak temperature reached was 133° F. during the 30 days succeeding the initiation of the experiments.

A second set of readings was made on the same land-fill about 40 ft. north of Set No. 1. These measurements began 24 days after laying the fill. The maximum temperature in this fill reached 151° F. but the air temperature at that time was 92° F. Thermometers were placed at depths of 3, 7, 11 and 14 ft. The temperature of the 14 ft. depth averaged about 20° F. below the maximum which occurred at the 3 ft. depth. This land-fill was affected by tidal waters and the lower depths were subjected to occasional wetting.

A third set of readings was made on a land-fill 10 months old. Temperature readings over several months indicated that the temperature of the fill had become stabilized at or near air temperature (about 70° F.).

A series of measurements were made on land-fill "B," 18 hrs. after the laying of the land-fill on July 20, 1939, with results as shown in Table 8.

Temperature measurements indicate

TABLE 8

Time after Laying Fill (hrs.)	*Temperature (3 ft. depth)*
18	110° F.
37	120° F.
107	140° F.
113	146° F.
180	148° F.
274	148.5° F.
346	146.0° F.
449	142.0° F.
540	130.0° F.
805	119.0° F.

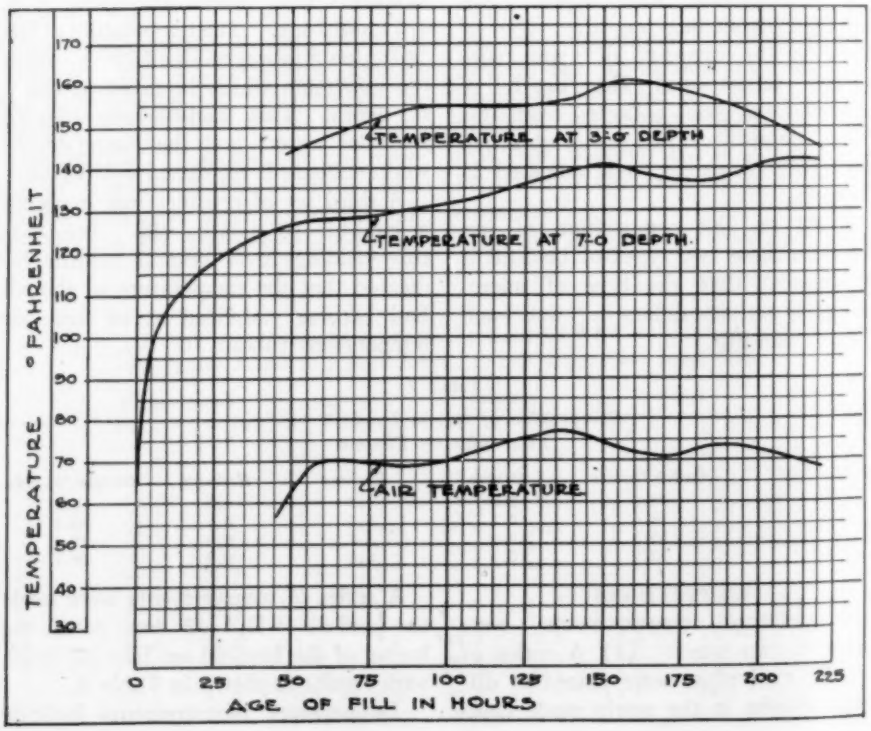
that the temperature will start rising immediately after the land-fill has been sealed, and reach a maximum in less than 10 days.

Figure 1 gives the relation between temperature and time when a thermograph was placed near the face of a new fill. This chart is typical of measurements being made indicating that the temperature in a new fill will rise to better than 100° F. within 24 hrs. and reach a maximum in very few days.

ODOR SURVEYS

Odors emanating from a land-fill are very difficult to measure accurately. Two different men were used on odor surveys, and these men made independent surveys of each land-fill many times during the summer. The method was essentially this: The observer would start from the point at which the fill was being made, record weather conditions, including relative humidity, temperature, wind velocity, and wind direction. He then recorded what odor he found at that point. By use of a compass, he walked 100 ft. to the north, again recorded weather conditions and the odor observed. He

FIGURE 1—TEMPERATURE CHART



continued in one direction until he had arrived at a point where no odor existed, recording all observations at 100 ft. intervals. He repeated this procedure until he had covered all points.

In this way, it was possible to investigate the odor situation, particularly on days of various humidities and with varying wind velocities in the four directions. During these odor surveys, 1,100 ft. was the extreme distance at which an odor was observed, and this was on a day when a 15 mile wind was blowing essentially in a northerly direction. In most cases, odors were not observed at distances over 200 ft. unless the wind was blowing somewhat in that direction. In addition to the observations made by two observers, all of the nearby homes were visited and the occupants interviewed on the subject of odors.

SUMMARY

Many of the studies contemplated in the project have not been completed. The subject of rats has been assigned to a specialist along that line, and a number of other physical features, such as settlement, structural studies, etc., are now being made.

NOTE: This investigation is being conducted by the land-fill project of the Work Projects Administration, sponsored by the Department of Sanitation of New York City, William F. Carey, Commissioner, and supervised by the Division of Sanitary Engineering of New York University. E. J. Ricer, Supervising Engineer for the Work Projects Administration, and Edward Stofka, Assistant Engineer, have been especially helpful in assisting the writers in preparation of data for this article.

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Our Nation's Health

"Today we are just beginning to catch a glimpse of the new world that would be made possible by proper international organization in all fields of work. In that new world, health and welfare for all would help to bring about conditions favoring a peaceful society within countries, and this would conduce to security in international relationships. A gradual diversion of the wealth now lavished on armies, navies, and air forces to housing, nutrition, medical care, education, and other social benefits would raise human welfare to a higher level than ever before. These benefits have been made possible by the advances of science; it is time to organize our international relationships in such a way as to make them available to the great mass of the people on this and other continents."—Frank G. Boudreau, M.D., Our Nation's Health —An International Problem, Carnegie Endowment for International Peace.

Medical Care of the Indigent Non-Hospital Contagious Patient

With Particular Reference to Whooping Cough*

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THE medical care of the indigent in New York City, a group including not only those on Home Relief, but also those whose income places them in the category of medical indigence, has always received serious attention from our health administration. The magnitude of this problem may be grasped if one studies the recent survey of hospital care in the Metropolitan area made under the auspices of the United Hospital Fund.[1]

The steady increase in dispensary attendance in New York City was shown [1] to have reached the surprising figures of 1,544,426 patients with a total of 6,923,029 visits during 1934 in a population of 7,346,007, a ratio of 1 patient to 4.6 of the population. In Manhattan, where most of our larger institutions are located, the ratio of the number of dispensary patients to the total population was much higher (1 to 2).

Along with the steady growth of our hospital units, this city has made plans for 30 health centers to be strategically located in the 5 boroughs to bring the facilities of the Health Department to local neighborhoods. Several of these centers have already been opened.

Despite all the years of building and planning and the millions of dollars spent annually, a large group of medically indigent has been overlooked. Rarely does one find that provision has been made for the underprivileged who become afflicted with a contagious disease, yet do not require hospitalization.

Most important of all these ambulatory patients are the infant and young child with whooping cough. To those who have served in a children's clinic I am sure this problem has presented itself over and over again. Perhaps some of you, who have served in a clinic where isolation facilities were inadequate, have witnessed the sad spectacle of an infant in the midst of a choking spell of whooping cough being hurried out into the street in the arms of a frantic mother by an equally frantic nurse who has become very much concerned about the other children filling the benches of the waiting room. And what do we hear as they reach the door? The mother pleads that she cannot afford a doctor, and asks where she can take her child. The reply usually is: "Take your child to the hospital for contagious diseases." "But," adds the mother, "my child is not sick, it only has whooping cough (only a disease which has a fatality of over 10 per cent for this age). Can't

* Read before the Section of Pediatrics at The New York Academy of Medicine, April 13, 1939.

you give me a bottle of medicine?" A bottle of medicine is perhaps given with the final remark: "Don't bring your child back here again until she is over the whooping cough."

How different is the situation in our clinics with adequate isolation facilities? Here too the physician, with rare exceptions, is obliged to send this patient home with perhaps a few kind words and the same bottle of medicine. There is nothing more he can do, for no provisions have as yet been made to give these patients follow-up care.

The scope of this problem extends even further since patients with bronchiectasis, tuberculosis, and other respiratory infections might easily be turned away and refused medical care because a spell of coughing common to these conditions led to an erroneous diagnosis of whooping cough.

Here let me call attention to a recent study by the Department of Welfare of New York City, on the care of 653 cases of contagion among home relief patients, for the 6 months December, 1937, to May, 1938. We find (Table 1) that among 105 cases of chicken pox 26 per cent developed some intercurrent infection (6 cases of otitis media, 5 cases of bronchitis, 3 cases of tonsillitis, and 1 case of cervical adenitis). Among the 157 cases of whooping cough, 3 cases went on to chicken pox, 1 developed scarlet fever, 6 were complicated with bronchial pneumonia, 5 with otitis media, and there was 1 case of cervical adenitis.

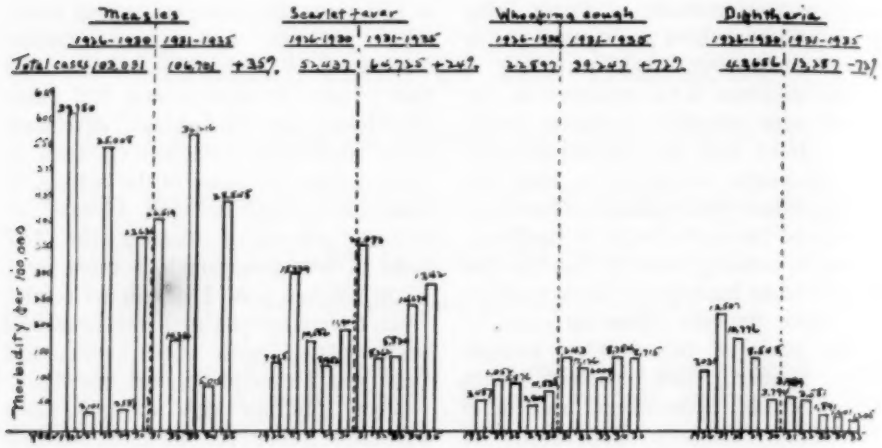
These findings may at first seem incredible. However, we must not lose sight of the fact that a large number of these indigent children are malnourished and live under conditions that make multiple infections quite common.

TABLE 1

Complications and Intercurrent Infections in 653 Cases of Contagious Diseases Treated by Panel Physicians of the Department of Welfare, New York City December, 1937, through May, 1938

Diseases	*Total Number of Cases*	*Per cent Frequency*	*Intercurrent Infections*		*Complications*	
Measles	128	25	whooping cough	(9)	bronchial pneumonia	(2)
			chicken pox	(9)	otitis media	(13)
			scarlet fever	(4)	cervical adenitis	(1)
			mumps	(1)	pyelitis	(1)
					arthritis	(1)
Mumps	138	17	whooping cough	(7)	bronchial pneumonia	(1)
			chicken pox	(7)	otitis media	(4)
					bronchitis	(4)
					cervical adenitis	(1)
Whooping cough	157	10	chicken pox	(3)	bronchial pneumonia	(6)
			scarlet fever	(1)	otitis media	(5)
					cervical adenitis	(1)
Chicken pox	105	26			otitis media	(8)
					bronchitis	(15)
					tonsillitis	(3)
					cervical adenitis	(1)
Scarlet fever	105	11			bronchial pneumonia	(1)
					otitis media	(9)
					cervical adenitis	(1)
					bronchitis	(1)
Miscellaneous	20		Varied combinations of the above complications and intercurrent infections			

CHART 1—Morbidity of Measles, Scarlet Fever, Whooping Cough, and Diphtheria in New York City, 1926–1935

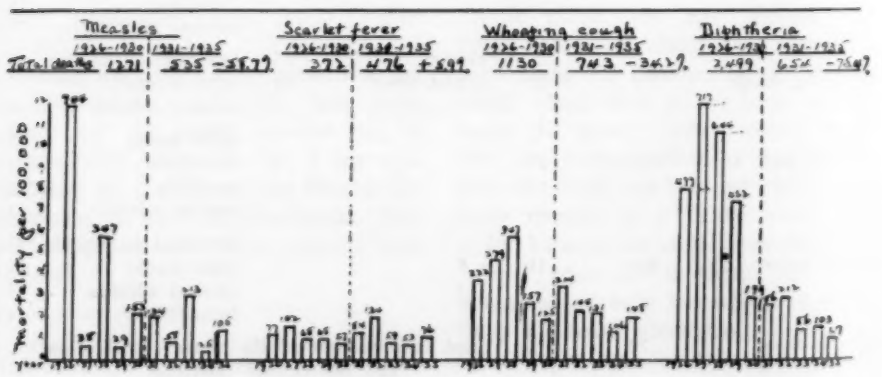


Whooping cough is known to have played havoc with our infants and young children since its first description as a clinical entity by de Ballou of Paris in the middle of the 16th century. Epidemics have been reported from every part of the globe. No climate and no race has been spared the great toll of life this disease carries with it yearly. Today it is endemic in practically all of our large cities.

In 1914 Crum [2] in a comprehensive statistical study of whooping cough over a period of 5½ years, covering 24 countries in different parts of the world, and based on a population close to 2 billion, reported that 1 per cent of the grand total of deaths from all causes was due to this disease.

Our comparative study of the four communicable diseases (measles, scarlet fever, whooping cough, and diphtheria) reported in New York City for the decennium 1926–1935, has also yielded interesting data (Chart 1). A striking drop (72 per cent) was noted in the incidence of diphtheria in the second half of this period compared

CHART 2—Mortality of Measles, Scarlet Fever, Whooping Cough, and Diphtheria in New York City, 1926–1935



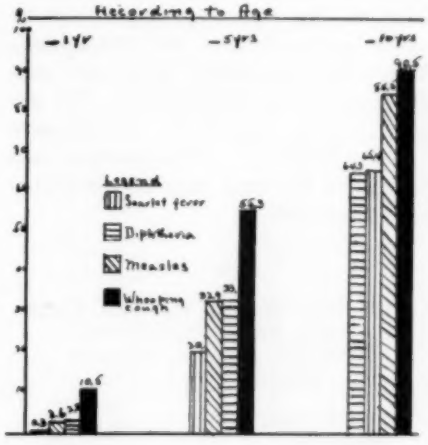
with the first half; measles showed a rise of 3.5 per cent, scarlet fever 24 per cent, and whooping cough a rise of 72 per cent. Baker's figures [3] for 1906–1916 differed somewhat from ours except in respect to whooping cough, which then too showed a similar rise in incidence (80 per cent). To be sure, deductions based upon reported cases of reportable diseases are always open to criticism, and at the most, one can employ such data only to indicate a trend.

Despite this marked rise in case incidence, the mortality figures for all these diseases showed an encouraging drop (Chart 2). However, the mortality figures from whooping cough during the second half of this 10 year period exceeds that of all the other contagious diseases.

The importance of analysis of cases according to age incidence is borne out by a survey for the years 1932–1934. During the first year of life there occurred 2.6 per cent of all cases of measles, 0.3 per cent of scarlet fever, 2.8 per cent of diphtheria, and 10.5 per cent of all cases of whooping cough. A comparatively high incidence of whooping cough was also noted in children under 5 years of age (Chart 3).

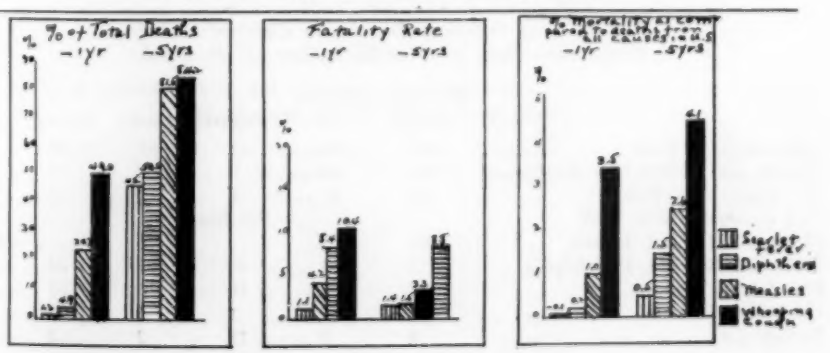
Much more impressive are the figures relating to comparative severity of whooping cough in infancy (Chart 4).

CHART 3—Per cent Morbidity of Measles, Scarlet Fever, Whooping Cough, and Diphtheria in New York City, 1932–1934—According to Age



Nearly half of all deaths from whooping cough occur in the first year of life, 24.7 per cent of all deaths from measles, 4.9 per cent of all deaths from diphtheria, and 1.2 per cent of all deaths from scarlet fever. A study of the mortality figures for the whole of the United States showed that whooping cough accounts for 3.5 per cent of all infant deaths under 1 year, measles for 1.0 per cent, diphtheria for 0.2 per cent, and scarlet fever for less than 0.1 per cent. Its mortality nearly equals the combined mortality for measles,

CHART 4—Mortality of Measles, Scarlet Fever, Whooping Cough, and Diphtheria in New York City, 1932–1934—According to Age



diphtheria, and scarlet fever in all children under 5 years.

The high mortality rate of whooping cough in early infancy is probably related to the type of complication to which young infants are predisposed. Thus the respiratory infections outweigh all other complications (60 per cent), and digestive disturbances follow (Table 2). Bronchiectasis and fibrosis of the lung may be discovered long afterward.

TABLE 2

1,000 Fatal Cases of Whooping Cough Showing Primary Complications (Prudential Industrial Mortality Experience, 1911–1913)

Broncho-pneumonia	286
Pneumonia	270
Bronchitis	56
Other Respiratory Diseases	15
Meningitis	44
Cerebral Congestion	9
Heart Complications	25
Digestive Complications	79
Nephritis	8
Dysentery	6
T.B.C. Lungs	9
Miscellaneous	45
No Complications	148
Total	1,000

Further tabulation of statistics is unnecessary to emphasize the serious threat to life and health which whooping cough makes in this city. The scope of this problem can scarcely be grasped from a study of published figures. Smith,[4] in his analysis of the important contagious diseases observed in the outpatient department of Bellevue Hospital, and in a few of the other leading children's clinics (Table 3), found that whooping cough exceeded by far all other contagious diseases that appeared in each of these institutions.

Our study of the hospital report sheets for contagious diseases submitted daily by the various institutions in the Borough of Manhattan to the Health Department from October 1, 1935, to September 30, 1936, is presented in Table 4. This limited survey covered a population of over 1,700,000, and may be considered representative of conditions in the other four boroughs of this city. In the 12 months during which this survey was carried on, 2,053 cases of whooping cough were reported from all sources, public and private; yet from the 30 institutions alone, a total of 1,444 cases were reported. Clinics serving congested and poorer districts reported the largest number of cases. Thus Harlem Hospital in the heart of the Negro section of Manhattan reported 362 cases, or more than twice the number from any other institution. Bellevue Hospital

TABLE 3

Prevalence of Infectious Diseases in Children's Clinics Comparative Data for Nine Institutions (C. H. Smith)

	Whooping Cough	*Chicken Pox*	*Diphtheria*	*Measles*	*Mumps*	*Total*
Bellevue, New York	578	118	43	87	78	976
Nursery and Child's New York	188	32	9	33	5	284
Mt. Sinai, New York	89	27	8	2	7	135
Post Graduate, New York			*Not Stated*			577
Children's Hospital, Boston	563	..	..	..	..	1,284
Children's Hospital, Philadelphia	72	39	26	33	48	231
Philadelphia Babies	162	31	16	25	18	319
Cincinnati General	11	7	1	1	2	24
Buffalo City	9	8	15	2	2	79

TABLE 4

Hospitals and Clinics in the Borough of Manhattan, New York City, and Number of Whooping Cough Cases Reported by Each During Year October 1, 1935–September 30, 1936

Beekman St.	24	New York Dispensary	40
Bellevue	161	New York	115
Beth David	13	New York Foundling	12
Beth Israel	19	New York Infirmary	17
Community	4	North Dispensary	14
City	10	Polyclinic	14
Flower and Fifth Ave.	30	Post Graduate	14
Good Samaritan	12	Roosevelt	13
Gouverneur	45	St. Lukes	20
Harlem	362	St. Vincent	30
Joint Diseases	80	Stuyvesant	5
Knickerbocker	6	Sydenham	6
Lenox Hill	22	Vanderbilt Clinic	123
Lincoln	14	West Side Dispensary	4
Metropolitan	68		
Mt. Sinai	147	Total	1,444

reported 161 cases, and Mt. Sinai Hospital 146 cases. The two new medical centers in this borough, which attract patients not only from their immediate neighborhood, but from all parts of Greater New York, showed 123 cases at Vanderbilt Clinic, and 115 cases at New York Hospital.

The disproportionately small number from private practice must be attributed in part to laxity in reporting. However, the important item to stress is that in a single borough, 1,444 cases of whooping cough were refused medical care in one year alone. Were it possible to learn how many additional cases developed in the same families and in other families already familiar with our present disposition of these cases, and who accordingly made no attempt to secure clinic treatment, one might record a much higher total.

The importance of the problem of the ambulatory patient with whooping cough has been stressed. However, the problem of care of the indigent confined to bed with a contagious disease, and quarantined at home because the mother for some reason cannot separate herself from her child is equally serious.

It is interesting from this standpoint to view the findings of Hume [5] in his study of the Handling of Communicable Diseases in New York State Municipalities in 1931. In his tabulation (Table 5), which covers 66 cities, and in which 39,603 cases of reported communicable diseases were studied, he

TABLE 5

Extent of Hospitalization of the Common Communicable Diseases for 1931 in a Study of 66 Cities in New York State (Hume)

Disease	*Cases Reported*	*Cases Hospitalized*	*Per cent Hospitalized*
Poliomyelitis	515	267	51
Diphtheria	737	326	44
Typhoid Fever	154	59	38
Scarlet Fever	5,106	1,744	34
Measles	11,312	494	4
Whooping cough	4,694	89	1
All other diseases	17,086	1,436	8

states that only 4,415 of these patients sought admission to the hospital. Of the cases of diphtheria, 44 per cent were hospitalized; of scarlet fever, 34 per cent; of measles, 4 per cent; and of whooping cough only 1 per cent. "These figures," says Hume, "are fairly representative of the practice of hospitalization in all of the municipalities of the state."

It is easy to understand why only 1 per cent of the cases of whooping cough are hospitalized when one recalls how commonly the child's mother dismisses the question with the statement: "My child only has whooping cough; all she needs is a bottle of medicine." Ignorance of the serious complications and sequelae of whooping cough is clearly the chief reason for its neglect. A similar ignorance exists concerning measles; to most mothers it is a disease every child is expected to have and to get over in a few days.

One need only reflect for a moment upon the great advances made in the conquest of diphtheria to realize the importance of public health propaganda. It must be obvious that only the public's ignorance of the facts concerning whooping cough is responsible for the present apathy in the face of the appalling fact that the mortality of whooping cough each year far exceeds that of each of the other contagious diseases in children. And yet, how can we hope to impress these families with the severity of this disease and the importance of proper care if we continue to turn them away when they apply for medical aid.

In so far as research is concerned, this disease is receiving a great deal of attention in laboratories throughout the world. But what of the indigent patient? There can be but one answer. This problem of whooping cough in childhood which ranks with that of tuberculosis, syphilis, pneumonia, and diphtheria, can only be solved by gaining the patients' coöperation and educating them to appreciate the severity of this disease. To accomplish this it is most important to observe and guide these patients during their illness.

One might ask: "Cannot the existing municipal and public hospitals and outpatient clinics be extended to meet this need?" It must be obvious that with rare exceptions our outpatient medical clinics cannot be utilized because we are dealing with contagious disease. To set up separate contagious clinics within walking distance of these patients' homes would entail a tremendous capital expense, and would incur a considerable public health risk if patients with contagious disease were permitted to travel through the streets or assemble in any one clinic. As for hospitalization for the duration of the infectious stage of the disease, one need only look at the cost per patient. The cost of hospitalization of a single case of whooping cough at Willard Parker Hospital in 1934 was $5.96 per day. The expense of such a procedure applied to all these patients would be prohibitive.

For the present there seems to be but one solution—to send the doctor into the homes of these patients. With the development of a properly trained personnel of physicians and nurses to administer to the medical needs of these patients and to insure proper quarantine measures, many now filling the wards of our contagious disease hospitals could be treated at home. The expense thus saved to the hospital would go far toward providing care for those patients who, up to the present time, have received no treatment whatever.

Accordingly, the following plan is proposed to aid in the working out of this idea: It is suggested that a Bureau for Home Care of Contagious Diseases be established perhaps under the supervision of the Department of

Hospitals. It is probable that a full-time director and one assistant will be required, who should make decisions on various questions and formulate policies. All calls for home care would be authorized through this bureau and referred to a visiting physician.

A panel of physicians should be drawn from among physicians who have volunteered to care for the contagious sick in their neighborhood for a set fee to be paid by the city. Every physician should be eligible. It might perhaps be advisable to give preference on this list to physicians who now offer their services in some similar capacity in the outpatient clinics of our general hospitals.

The question of eligibility of patients for this home care must be weighed carefully to prevent abuses. An ideal setup would call for the establishment of a Central Registration Bureau where all medically indigent persons would be registered and reinvestigated annually. The difficulties that now prevent the establishment of such a bureau will, it is hoped, be overcome within a few years. Meanwhile it is suggested that eligibility be limited to those who have previously been registered at one of our free general clinics where their financial status has been checked. Because of the importance to the community of prompt isolation of contagion, it is perhaps wiser to encourage rather than restrict too frequent use of the services of the Bureau for Home Care.

The care of the whooping cough patient will depend first upon the patient's age. Wherever possible, the infant in the first 3 months of life should be referred to the hospital, where transfusion or other supportive measures often indicated in these young patients can be administered, and where every effort will be made to keep the case one of whooping cough. The other children in the first year of life not so sick as to require constant watching may be seen twice a week through the first 4 weeks of the disease, and the patient then referred to the general clinic for further follow-up. The patient in the 2nd and 3rd year of life who does not require close watching may be seen at intervals of 1 week. Children beyond the age of 3 years, after a careful examination at the original visit, may be seen at intervals of 2 weeks. Every case that needs careful watching will be referred to the hospital.

This home care service should not be limited to the care of whooping cough cases alone but should extend to all the other contagious diseases where hospitalization is not indicated. The physician in the clinic and the supervisory nurse in charge should be instructed that all patients found to have a contagious disease requiring further care should be referred to this bureau. The uncomplicated case of chicken pox, German measles, and mumps should be instructed at the time the case is discovered as to further care of this condition. The patient, however, should be informed that in the event of the appearance of untoward signs or symptoms, he may call up the bureau where further instructions will be given, and a doctor sent to the home where indicated. These patients should be further directed to return to the general clinic at the end of the period of contagion for check-up and for a note permitting the patient to return to school.

This information should become common knowledge among all those coming in contact with patients falling into this category. In the event that such an uncomplicated case comes to the attention of the bureau by someone other than a physician the bureau will send one of its staff to the home to give the necessary instructions to the patient.

SUMMARY AND CONCLUSION

1. The care of the medically indigent has always received careful and serious attention of our health and hospital authorities.

2. In New York City during 1934 the total number of patients attending the free general clinics was 1,544,426—the number of visits totalled 6,923,029; a ratio of 1 patient to 4.6 of the population and one visit to 1.04 of the population.

3. Rarely do we find that provision has made for medical care to the indigent with a contagious disease when hospitalization is not indicated.

4. The case of whooping cough is stressed because of its high mortality, which far exceeds that of any other contagious diseases.

5. Of all whooping cough cases 10.5 per cent occur in the first year of life as compared to 2.8 per cent for diphtheria, 2.6 per cent for measles, and 0.3 per cent for scarlet fever.

6. Of all whooping cough cases 55.3 per cent occur in children under 5 years as compared to 33 per cent for diphtheria, 32.9 per cent for measles, and 20 per cent for scarlet fever.

7. The fatality rate under 1 year is 10.4 per cent for whooping cough, 8.4 per cent for diphtheria, 4.2 per cent for measles, and 1.1 per cent for scarlet fever.

8. Of all the deaths from whooping cough 49 per cent occur in the infant under 1 year. In measles it is 24.7 per cent, diphtheria 4.9 per cent, and in scarlet fever 1.2 per cent.

9. Whooping cough is responsible for 3.8 per cent of all the deaths from all causes in children under 1 year, and for 4.1 per cent of all the deaths in children under 5 years. In measles this figure reaches only 1 per cent in the infant under 1 year, and 2.6 per cent under 5 years. Diphtheria shows 0.2 per cent under 1 year and 1.5 per cent under 5 years. Scarlet fever 0.5 per cent under 1 year, and less than 0.1 per cent under 5 years.

10. In one year 1,444 cases of whooping cough were reported from the free clinics of the Borough of Manhattan alone; and only 2,053 cases were reported from both private and free clinics for this period. The latter figure is explained by laxity of reporting in private practice.

11. Our failure to guide these patients during the period of quarantine is undoubtedly a contributing factor not alone in the further spread of the disease but also in its high mortality figures.

12. A plan is offered whereby organized medical care at home for the indigent non-hospital patient with a contagious disease could be insured.

13. The proposed plan will allow for the care at home of many of the patients that now occupy beds in the wards of the hospitals for contagious diseases. This saving it is hoped will go a great way toward paying for those indigent patients that heretofore have been denied all medical care.

At this point it should be said that the writer is fully aware that no new ideas on the subject of contagious diseases are presented in this paper. It is simply intended again to call attention to a serious problem in public health which heretofore has failed to receive proper consideration.

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Falciparum Malaria among Drug Addicts*

Epidemiologic Studies

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IN 1929, there appeared in Cairo, Egypt, a new vogue in drug addiction. This was the intravenous use of heroin and the practice by drug addicts using heroin, of sharing a common hypodermic syringe for its administration. On this fact hinges the explanation for the occurrence, in New York City, of a disease usually uncommon, but now endemic in it—falciparum malaria.

The origin of this practice has been variously explained. It is probably related to the knowledge among drug addicts that drugs used in the treatment of helminthic and protozoal diseases are more effective when given intravenously than when taken orally. Also, heroin administered intravenously produces a more rapid and heightened effect. Furthermore, the common use of a hypodermic syringe by many drug addicts reduces the likelihood of apprehension, arrest, and conviction for the possession of drugs or apparatus for their administration. Finally, from the economic standpoint it is possible for several addicts who are unable to purchase a small quantity of the drug, by pooling their resources to be assured of at least one or more doses by the wholesale purchase.

The epidemiologic implication of such a practice in Egypt, where malaria is common, is obvious and in 1929 Biggam [1] described the first epidemic of malaria among drug addicts resulting from the common use of a hypodermic syringe. All the cases were dysenteric in type, and the parasite in each was *Plasmodium falciparum*. Shortly afterward, there appeared in the United States reports of isolated cases of this disease in drug addicts, and in 1934, Helpern [2] described 49 cases in New York City. Clinically, these cases were principally of the cerebral variety, and were associated with a very high mortality rate.

During the past 5 years, this disease seems to be well established in New York City. There are now to be seen cases of falciparum malaria among drug addicts almost at all times on the wards of Bellevue Hospital. The author has had the opportunity of studying well over 200 cases. Dr. Helpern, in a personal communication, stated that he has performed 120 autopsies on drug addicts who have died from malaria in New York City. This is only a slight indication of the probable incidence of the disease among drug addicts in New York and other large cities. The knowledge of its occurrence among drug addicts is well known to them, and many treat themselves with quinine.

* Read before the Epidemiology Section of the American Public Health Association at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 17, 1939.

TABLE 1

A. Bellevue Hospital

	1928–1933	*1933–1938*
Average yearly admissions	59,000	61,940
Average yearly drug addicts	87	137
Av. addicts 1,000 adms. per year	1.5	2.2
Total malaria admissions	70	180
Av. malaria 1,000 adms. per year	0.24	0.50

B. Third (New York University) Medical Division

	1928–1933	*1933–1939*
Drug addicts	32	120
Total malaria	20	42
Malaria in drug addicts	0	34
Malarial fatalities	0	8

C. Types of Malaria (Third Medical Division)

	1928–1933	*1933–1939 Non-addicts*	*1933–1939 Addicts*
P. vivax	12	6	1
P. falciparum	2	1	32
P. malariae	0	0	1
Undetermined	2	1	0
Diag. on history only	4	0	0
Total	20	8	34
		42	
Fatalities	0	0	8

D. Types of Malaria, Bellevue Hospital, 1938

	Non-addicts	*Addicts*
P. vivax	7	1
P. falciparum	1	45
Total	8	46
Fatalities	0	9

E. Psychiatric Division, Bellevue Hospital, 1938

Number of admissions	26,210
Drug addicts	71
Drug addicts with malaria	27
Malaria fatalities	4

F. New York City, 1938

Types of Malaria	*Number of Cases*
P. vivax	24
P. malariae	2
P. falciparum	50
Unknown	16
Mixed	1
Total	93

TABLE 2

Mortality in Falciparum Malaria in Drug Addicts

	Psychiat. Div.		*3rd Med. Div.*		*Combined*	
Year	*Cases*	*Deaths*	*Cases*	*Deaths*	*Cases*	*Deaths*
1933	5	3	3	3	8	6
1934	2	1	7	2	9	3
1935	10	4	2	0	12	4
1936	4	2	4	0	8	2
1937	11	4	3	1	14	5
1938	23	4	12	2	35	6
Total	55	18	31	8	86	26

It is therefore likely that the number of acute patients who seek admission to the hospital represents only a small percentage of the cases among the drug addict population.

EPIDEMIOLOGY

Naturally acquired malaria is very rare in the metropolitan area of New York City. In the 5 years, 1928–1933, there were only 70 cases recorded in Bellevue Hospital. In the 5 years, 1933–1938, the period under consideration in this report, there occurred 180 cases of malaria in approximately the same number of admissions. This difference is due to the continued admission to the hospital of drug addicts suffering from falciparum malaria in the latter period.

This is borne out in the Tables (1a, 1b, 1c, 1d) by the fact that prior to 1933, when this form of malaria was first recognized, the number of cases caused by *Plasmodium falciparum* accounted for only a small number of the total, whereas following 1933 the number of cases of falciparum malaria made up by far the majority of the total.

In 1938, there were 54 cases of malaria seen in the entire hospital, of which 45 were falciparum occurring in drug addicts. There were 9 fatal cases, and these were in the addict group. There were only 8 cases in non-drug addicts and naturally acquired, of which 7 were due to *Plasmodium vivax*.

Prior to 1933, one very rarely saw a case of malaria in the Psychiatric Division of Bellevue Hospital. During the period of this study, however, more than 50 cases of malaria, all falciparum, and many of them fatal, were observed in this division.

The incidence and mortality of malaria in the metropolitan area of New York is therefore almost entirely due to the occurrence of the malignant form of the disease among drug addict population, who practise the common use of hypodermic syringes.

TRANSMISSION

The technic of injection and transmission is very simple. In some cases a complete medical hypodermic syringe and needle were used. In other instances, the apparatus is improvised by fitting a needle to the end of an eye or medicine dropper with the aid of a piece of rag or newspaper or cigarette paper. The drug is often dissolved in a teaspoon, aided by the heat of a burning match. If the injection is for one individual, he draws the drug into the syringe and attempts to insert the needle into a vein. The successful trial is known by the appearance of blood in the syringe. The drug mixed with the blood is now forced into the vein and to insure that it is all obtained,

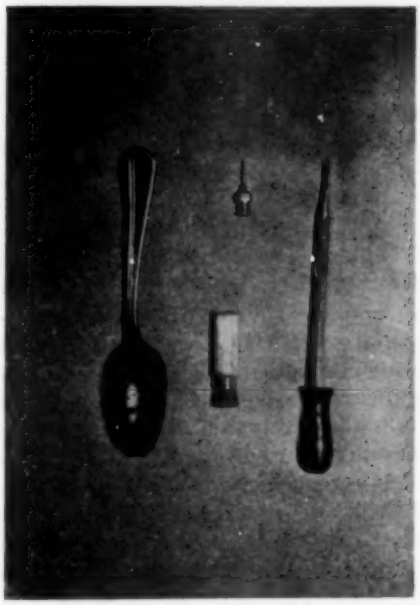


FIGURE 1.—IMPROVISED HYPODERMIC APPARATUS

Improvised hypodermic apparatus for self administration of heroin. The drug shown in the vial is dissolved in the spoon and drawn up into the medicine dropper, which acts as a syringe.

the syringe is again filled with blood and the contents emptied into the vein. Frequently, another addict is waiting his turn to use the apparatus and to have his share of the drug. Without washing or other attempt at cleaning the syringe, he repeats the process described. It is obvious that if the first individual has plasmodia in his blood in fair numbers, the addict following him will not only receive his share of the drug, but plasmodia as well.

PARASITE

The outstanding species of parasite in this disease is *Plasmodium falciparum*. Although a few cases have been reported in which the parasite was either of the quartan or benign tertian variety, the majority of cases, by far, in the larger epidemics studied have been due to *Plasmodium falciparum*. In a careful study of the morphology of the plasmodium in approximately 200 cases, I have found only one infection with *Plasmodium vivax* and one with *Plasmodium malariae*. All the others were caused by *Plasmodium falciparum*.

CULTURE

Numerous attempts to culture the parasite obtained fresh from the blood of untreated individuals were unsuccessful. Often blood was used which contained an overwhelming infection and occasionally moderate or light infections were tried. Various methods and culture media were utilized. This experience coincides with that of Coggeshall [3] at the Rockefeller Institute, who made many attempts to culture the parasites obtained from the cases in the New York drug addict series.

ANIMAL INOCULATION

Efforts were made to transmit this species of plasmodium to monkeys (*Macacus rhesus*) by injecting 20 cc. of fresh, heavily infected blood intramuscularly. The monkeys failed to show evidence of infection, clinically or hematologically, and when killed later, there were no signs of malarial infection in the organs. This, too, coincides with Coggeshall's experience.

MOSQUITO INFECTION

The itinerant nature of drug addicts, the fact that many self-treated later become gametocyte carriers, and that routine blood study of many drug addicts disclosed a moderate number of symptomless carriers, made it desirable to see whether anopheline mosquitoes could be infected by feeding them on treated and untreated drug addicts.

Female *Anopheles quadrimaculatus* mosquitoes were obtained through the courtesy of Dr. Coggeshall of the Rockefeller Institute. They were allowed to feed on the thigh of a drug addict who had recovered from an attack of severe malaria, which he had contracted by the method described. The patient was afebrile and showed a moderate number of gametocytes in his peripheral blood. After the elapse of a week, Dr. Coggeshall dissected a few mosquitoes each day. The last 3 insects of 8 dissected were positive, containing 15, 21, and 23 oocysts respectively, proving the infectivity of drug addict blood containing gametocytes for anopheline mosquitoes.

If a sufficient number of addicts, whether recovered but incompletely treated, or asymptomatic carriers of gametocytes should accumulate in an area where suitable mosquitoes are abundant, a serious epidemic of malaria involving the healthy population may occur. Likewise, an epidemic may occur if a sufficient number of suitable mosquitoes should accumulate in a nonmalarious area where infected addicts are abundant.

It is of particular note in this connection that "Light Traps" for mosquitoes placed in and around New York

City and Nassau County in Long Island revealed that there was local *Anopheles quadrimaculatus* production!

CLINICAL ASPECTS OF THE DISEASE

The outstanding clinical feature of the cases seen early in the history of this disease in New York were predominantly cerebral. In fact, many of the original cases were severe instances of cerebral malaria with a high mortality rate. This feature differed from that reported in the first Egyptian series, in which dysenteric symptoms seemed to predominate almost exclusively. Some investigators felt that this difference, and the tendency for the disease to be manifest clinically through one system complex (central nervous), suggested a specific neurotropic strain of *Plasmodium falciparum* as the etiologic parasite.

Time, however, and the distribution of the disease among a fairly large number of individuals, has given us the opportunity to see the different clinical varieties of malignant malaria, including the simple, the cerebral, the dysenteric, and even the relatively uncommon " blackwater " type of *Plasmodium falciparum* infection.

The author is of the opinion that except for the non-biological mode of transmission the disease as it is seen in the drug addicts in New York or elsewhere simply represents the usual course of infections with the malignant tertian parasite, in no way different from that seen even in tropical Africa.

A complete description of the clinical

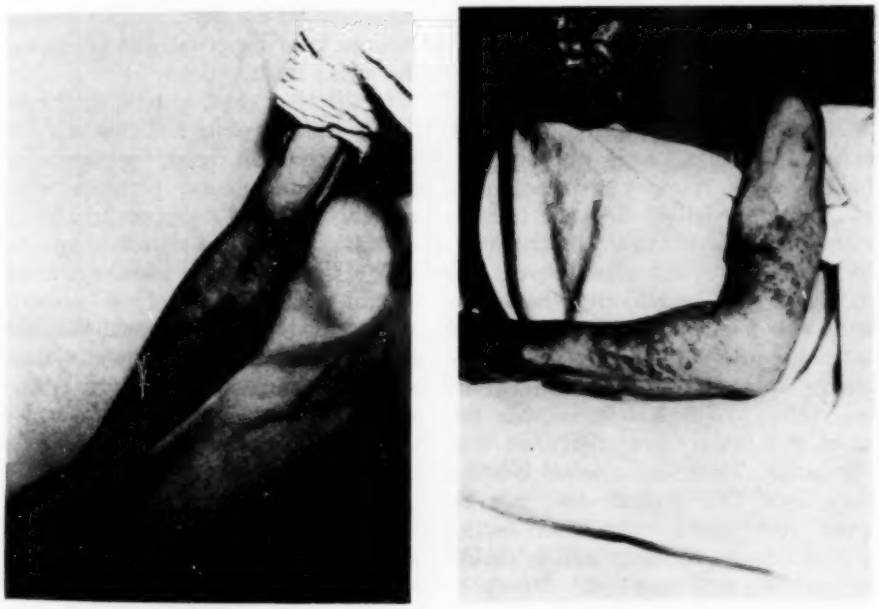


FIGURE 2—EVIDENCE OF DRUG ADDICTION

(a) Forearm of intravenous heroin addict. Note the prominent vein over the forearm and in the antecubital fossa. These veins are pigmented and often scarred and partially thrombosed.

(b) Forearm and arm of a subcutaneous heroin addict. There are numerous superficial and deep scars. The skin is pigmented and thin over healed injection sites.

syndromes encountered will be published elsewhere.[4]

GENERAL CLINICAL CONSIDERATIONS

1. *Age, Sex, Occupation, and Geographic Origin:*

There were only two females in this series and both died; one of the cerebral malaria and the other of acute diffuse glomerular nephritis.

The males were of young and middle adult age. Most of them had no given occupation; some were sailors; the rest worked at various unskilled trades when they did have a job.

The majority of the addicts lived in and about New York. Many were born in the United States, Puerto Rico, Cuba, and the West Indies. In recent years the patients have been predominantly young colored males from Puerto Rican and Negro sections of the city. Most of them had not been out of New York for many years.

2. *Onset, History, Temperature:*

There were no characteristic modes of onset. In most cases careful questioning after recovery revealed that for weeks they felt ill. In some, nausea, vomiting, and diarrhea predominated. In others they felt chills, fever and headache. In the majority the symptoms were very vague and consisted of a mixture of gastrointestinal complaints with headache, muscle pains, and chills. In a few individuals the onset was acutely progressive, so that the patient lapsed into unconsciousness very soon. No typical onset can be given. Any "queer" complaints lasting several days in the drug addicts should be regarded with suspicion.

The temperature reaction in *Plasmodium falciparum* malaria is classically unpredictable. There may be a suggestion of the tertian cycle (Figure 3, Chart 4), but in general the temperature curve follows no given pattern. Some of the cases exhibited the double daily rise (Figure 3, Chart 3) often described in malignant tertian malaria; others had quotidian fever (Figure 3, Chart 1); and others were totally irregular (Figure 3, Chart 2). The fever often showed little alteration during treatment in the fatal cases (Figure 3, Chart 1), and in the cases which recovered there was considerable fever even several days after treatment was begun. In some cases there was little or no fever. Any fever in a drug addict should be suspected of being related to malaria no matter how little the fever may be and no matter what the chart may look like.

3. *Diagnosis:*

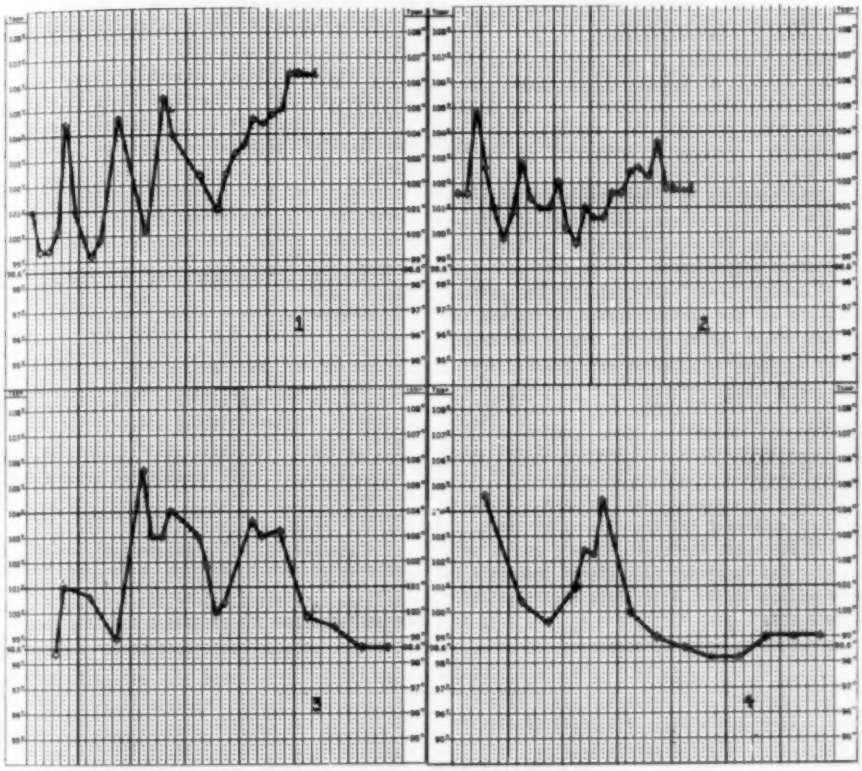
Before the disease was well known the diagnosis may have been difficult. It is easy to understand why diagnoses of various cerebral syndromes were made and why a host of other medical diseases were suspected, and to condone the errors made.

In the absence of history, the physical evidence of drug addiction (prominent superficial veins, pigmentation, scarring, thrombosis, puncture sites, and subcutaneous and superficial ulcers or scars) is the one reliable diagnostic sign (Figure 2). This knowledge and a careful examination of a properly stained blood smear are usually all that are necessary to make a proper diagnosis. Other physical signs or laboratory aids which may be helpful in the diagnosis of malaria did not occur with sufficient regularity to be entirely relied upon. Splenomegaly occurred in less than half the cases; the temperature curve is not characteristic; monocytosis was found in only about 1 out of every 6 cases; and other laboratory findings are not exclusive of a great many diseases.

It has already been stated, but it may be repeated with benefit, that any acute illness or unexplained clinical syndrome in a known addict or in an

FIGURE 3—Temperature Charts—Falciparum Malaria in Drug Addicts

CHART 1—Fatal Case—Quotidian Type of Fever
CHART 2—Fatal Case—Irregular Type of Fever
CHART 3—Recovery—Double Peaks
CHART 4—Recovery—Tertian Type of Cycle



individual showing evidence of heroin addiction warrants entertaining a provisional diagnosis of malignant malaria. A well stained blood smear should be carefully and repeatedly examined for plasmodia. If as a result of inexperience or improper facilities a diagnosis of malaria cannot be made the matter of quinine therapy must be considered. Unless other specific measures are indicated, and the condition of the patient fails to improve, the drug should be given. It cannot harm the patient and should not interfere with other diagnostic measures or steps to arrive at a correct diagnosis if this should not be malaria.

4. *Mortality:*

The disease, even after early diagnosis and intensive therapy, is a serious one. The table of mortality (Table 2) bears this out.

In the last few months of 1933, when the epidemic first was recognized in New York, most of the patients died. In some instances the condition was not recognized and in others, when the diagnosis was made, the disease had progressed to such a stage that treatment was of no avail.

In more recent years, the mortality experience in the cases observed on the Psychiatric Division is somewhat higher, probably due to the fact that

many of the patients seen on that service entered the hospital in the well advanced cerebral form of the disease.

SUMMARY, CONCLUSIONS AND SUGGESTIONS

1. New York City is an endemic area for the occurrence of falciparum malaria. The disease occurs almost exclusively among heroin addicts who practise the common use of hypodermic syringes. Infection is direct from man to man.

2. The parasite is *Plasmodium falciparum* and after 5 years of asexual transmission from man to man, it is still capable of infecting anopheline mosquitoes.

3. Clinically and pathologically the disease manifests all the characteristics of falciparum malaria as it occurs in the tropics, including various cerebral, intestinal, and hemoglubinuric syndromes.

4. The outstanding diagnostic feature is the history or evidence of drug addiction. On this evidence obscure syndromes in drug addicts warrant specific therapy.

5. Early diagnosis and intensive therapy are still followed by high mortality rate.

6. A thorough mosquito survey and a survey for the incidence of malarial infection in drug addicts in the New York area should be carried out.

7. Drug addicts recovered from malaria should be under the legal jurisdiction of the city department of health.

8. All available contacts with drug addicts should be explored and latent or asymptomatic carriers treated.

9. Treatment should include the use of an effective gametocidal drug.

10. There is local *Anopheles quadrimaculatus* production in the New York City area.

11. The possibility of an epidemic involving the healthy population must be borne in mind.

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Voluntary Agencies

I HAVE sometimes heard the fear expressed that the National Health Program would do away with the need for the voluntary agencies. Nothing could be further from the facts. The implications of the National Health Program are that more responsibilities, more work, and for many years to come an intensification of service, is the lot of the voluntary agency. We shall need all of our facilities, public and private, if the program is to meet its objectives. —Paul V. McNutt, Federal Security Administrator, in address before the National Health Council, New York, February 15, 1940.

Epidemiology of Anthrax in North Dakota*

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IN spite of knowledge developed by classical studies, cases of human anthrax continue to occur in the United States. Because of relative rarity and high fatality rate they receive widespread attention in the press and occasion considerable anxiety to the affected locality. That the menace, though not great, is still none the less real, would appear from collected information [4, 5, 6, 10] and from recent experience in North Dakota.

In the United States human anthrax has been considered primarily an industrial disease. It has been most frequently contracted from handling infected animals, skins or hair. Smyth [3] in a recent study of the sources of infection in 724 cases of human anthrax between 1919 and 1927, showed that the largest number occurred in the tanning industry, followed by the wool industry, cattle, shaving brushes, hair, and fur.

The number of human cases of anthrax reported to the U. S. Public Health Service from 1920 to 1938, inclusive, was 1,749.[2] The number of deaths attributed to this cause by the Bureau of the Census from 1920 to 1937, inclusive, is 391 (see Table 1). The indicated fatality rate based upon these reported cases and deaths is approximately 24 per cent. While there seems to have been some decrease in mortality during recent years, there has been little change in reported morbidity since 1927. The author agrees with Smyth,[4] however, that the available figures for this disease are subject to a large error both on the side of completeness of reporting and of accuracy of diagnosis.

TABLE 1

Anthrax in Man

Number of Cases of Anthrax in Man and Deaths from the Same Disease Reported in the United States for the Years 1920 to 1939

Year	*Cases*	*Deaths*
1920	134	36
1921	79	43
1922	89	42
1923	147	22
1924	197	27
1925	114	21
1926	139	17
1927	78	19
1928	90	18
1929	84	20
1930	91	23
1931	71	21
1932	58	24
1933	51	19
1934	68	10
1935	63	9
1936	77	17
1937	65	3
1938	54	..
Total	1,749	391

Since 1928 there have been reported to the North Dakota State Department of Health 5 human cases with 2 deaths.

* Read before the Epidemiology Section of the American Public Health Association at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 20, 1939.

The only available information on the first of these was obtained from a death certificate, dated August 7, 1928. It showed that the infected person was a male, age 68 years, a farmer residing in Neche, Pembina County. The patient was first seen by a physician one day before death. Laboratory confirmation of the diagnosis was not obtained and no further information was available.

The other 4 cases have occurred during the past 2 years and upon them more extensive information is available. One of these belongs to the type arising from contact with infected animal brushes. The other 3 were in farmers and apparently due to direct contact with infected animals.

CASE 2

This case, occurring in August, 1938, proved to be especially interesting because of the source of infection. The patient was referred to the State Department for diagnosis because of a suspicion of anthrax by the attending physician. The patient had an indurated lesion approximately 5 cm. in diameter on the left side of the neck, somewhat similar in appearance to a furuncle. However, there was a central, black area of necrosis approximately 1 cm. in diameter and around the periphery there were several small vesicles. A large area of edema was noted around the pustule. A tentative, clinical diagnosis of anthrax was made by the epidemiologist. The patient stated that he first noticed what he called a small "pimple" on the left side of the neck on August 6. He observed an area of redness around this, and the "pimple" rapidly developed into what he thought was a "boil." Except for the swelling in the neck and a slight amount of pain, the only symptom noticed was headache. Although the first symptoms developed August 6, he first consulted a physician on August 13. Direct smears of material from the lesion showed organisms corresponding morphologically and tinctorially with the anthrax bacillus. The patient was removed to a hospital and given 100 cc. of anti-anthrax serum intravenously and 50 cc. more the following day. Except for a slight serum sickness, recovery was uneventful.

For further laboratory confirmation a blood sample had been taken for culture, and material had been obtained from the lesion for culture and guinea pig inoculation. In spite of the fact that these proved negative, we were convinced from the history, physical findings, and direct smear examination that this was a case of anthrax and that an investigation to determine the source of infection was indicated.

Epidemiological Investigation — The patient, R. B., a 35 year old male, was a transient harvest laborer who had come to North Dakota approximately 3 weeks before the onset of the disease. He stated that he had been working only with tractors and farm machinery and insisted that he had not been in close contact with cattle, sheep, or horses either healthy or sick; nor, to his knowledge, had he been in contact with any sick people. On further questioning, it was learned that he had purchased and used a new shaving brush approximately 6 days before the onset of symptoms. As this was within the generally accepted maximum incubation period of 7 days,[5] this lead was followed. The shaving brush was obtained from the farm home where he was employed. The bristles were divided into three portions, and a sample sent to each of the two state laboratories and to the National Institute of Health for bacteriological examination, which showed the presence of a pathogenic, sporulating aerobe, culturally and morphologically identical with *Bacillus anthracis* in 2 of the 3 samples examined.

Because of the possibility that the contamination of the shaving brush with *Bacillus anthracis* might have been the result of the patient's infection rather than the cause of it, it was necessary to obtain other unused brushes of the same kind for examination. The patient had purchased his brush at a local variety store. The type of brush could be identified by the imprint "Imperial, Sterilized, Japan 332." Four more brushes of the same type were obtained, and examined bacteriologically by the state laboratories and the National Institute of Health, with the result that anthrax spores were found in all 4. Another group of 4 brushes purchased at the same store *but not* bearing the same imprint were examined *without* isolation of *Bacillus anthracis*.

On August 23, 1938, a sample of the bristles of the patient's shaving brush was sent to the National Institute of Health for laboratory examination to determine whether or not *Bacillus anthracis* could be isolated. Because of the interstate implications, a summary of the preliminary epidemiological investigation suggesting that a shaving brush was the probable source of infection was forwarded to the U. S. Public Health Service on August 31, 1938. The final report including all the evidence available from the North Dakota laboratories was sent to the Surgeon General on December 28, 1938. The Interstate Sanitary District Office of the U. S. Public Health Service then followed down these brushes from the wholesale establishment to learn the source and distribution. The U. S. Public Health Service traced shipments of shaving brushes back to the importer. A report of the Surgeon General[6] stated that "more than 35,000 of these brushes received in four shipments from Japan since 1937 have been sold or distributed." Because of incomplete and missing records of the distributors and others concerned, it was impossible to locate all stocks of these brushes. The State Department of Health obtained from the U. S. Public Health Service a list of all North Dakota retail agents of the distributor and all remaining unsold stocks of this type of brush were obtained for condemnation. Through the coöperation of the press, the public was informed of the potential danger of these brushes and anyone possessing a brush of this type was urged to forward it to the State Department of Health or the local health officer. However, only 36 brushes have been returned, to date, in North Dakota.

Another report from the U. S. Public Health Service states:

> Several brushes, taken from the remainder of the importer's stock, were found to be contaminated with anthrax spores and a great variety of other bacteria when examined by both the National Institute of Health and the New York City Health Department. This finding suggests that this entire importation might have been infested with anthrax spores.
>
> The importation of these brushes was covered by a consular certificate as required by the Foreign Quarantine Regulations. These regulations require that shaving brushes from abroad be accompanied by a consular certificate stating that there is no anthrax present in the area and describing in detail the sterilization process used.
>
> On or about January 23, the Surgeon General requested a ban be placed upon the importation of shaving brushes from Japan.[7]

On March 16, 1939, the Quarantine Regulations of the United States were amended to require not only a consular certificate but also a certificate of bacteriological examination of shaving or lather brushes of foreign origin showing freedom from anthrax infestation.[8]

In connection with this case of anthrax it is interesting to note that the Wisconsin State Board of Health reports the same type of shaving brush as the probable source of infection in an anthrax death occurring in that state. To quote from this report:

After having recorded no death from anthrax in 10 years, Wisconsin recorded such a death in July, 1938, the victim a Marinette County man. Laboratory tests bore out the shrewd diagnosis made by the family physician. When the current situation was publicized in January, the Marinette man's widow read of it and a few days later communicated to the State Board of Health that she had remembered that her husband had purchased a shaving brush shortly before his death. The brush being still in the household, she examined it and found the fatal imprint, "Imperial, Sterilized, Japan, 332," upon the handle.[9]

It is interesting to note, however, that from a shipment of 35,000 brushes, a considerable proportion of which were contaminated with anthrax spores, only 2 human infections have been recognized, reported, and traced to this source by epidemiological investigation.

Smyth [4] reports 69 cases of human anthrax in which the shaving brush was the source of infection, during the period 1919–1938. Six cases of this group occurred during the period 1934–1938. Smyth in his report points out that "shaving brush cases, formerly so prevalent at about the time of the World War, have been greatly reduced in number, but they still keep cropping up, and when they do, they have a fatality rate of from 50 to 66 per cent." In spite of the fact that Hull [1] in 1930, concluded: "The shaving brush has ceased to be a hazard," the thought that 6 cases of this type have been reported in the last 5 years, with a high fatality rate, and that there are undoubtedly a number of anthrax infested brushes on the market now, should make one hesitate to ignore the shaving brush as a potential source of infection.

CASE 3

This was the first reported case of anthrax on the records of the State Department of Health and occurred in a resident farmer in 1937. The patient became ill on August 15 when he complained of malaise, fever, and pain in the left arm and hand. The physician who first examined him did not make a diagnosis. Three days later the symptoms became more severe, and the patient was referred to another physician. Examination revealed two lesions on the left hand and arm which were typical of anthrax, clinically, and the diagnosis was confirmed by direct smear examination. Guinea pig inoculation was not done. This patient was given serum, and made an uneventful recovery. It was found that the patient had skinned three cows which had died suddenly on his farm between August 6 and August 13. Although he did not suspect the cause of sickness in his cattle, post-mortem examination of the second animal he skinned showed the cause of death to be anthrax.

It was noted that there were no known cases of anthrax in cattle on this or any neighboring farm, and no new cattle had been purchased or brought into the community for a period of 15 months. The records of the State Livestock Sanitary Board showed that the only known anthrax in cattle in this region occurred 6 years previously on a farm approximately 28 miles distant.

CASES 4 AND 5

These were cases of agricultural anthrax and are considered together because they occurred at the same time and had the same source of infection.

The first information on Case 4 was received from the State Veterinarian who informed the epidemiologist that a report had just been received of the death of a group of anthrax infected cattle and that it was rumored that one of the owners of the cattle was sick. A field investigation showed that the patient, a male farmer age 24, had a clinically typical anthrax lesion on the right elbow. Eleven cattle belong-

ing to this farmer had died within 1 week, but because he believed death was caused by "poison weed," he removed the hides before disposing of the carcasses. His anthrax lesion appeared 3 days after handling these cattle. He was given serum and recovered after a stormy convalescence.

Three other persons who helped skin these cattle were examined at the time of investigation of Case 4, and Case 5 was discovered in this group. This person said he was not ill, but it was noted that the fourth finger of his left hand was bandaged. This, he explained, was "sore from a thistle thorn infection." However, it was found that the lesion was an anthrax pustule, and the patient had a temperature of 101.4° F. In spite of his protestations that he was not sick, he was hospitalized and given serum although given intensive therapy. This case terminated fatally 2 days later. Direct smear examination confirmed the clinical impression but a culture from the lesion, blood culture, and guinea pig inoculation were negative. The second day the patient developed an anthrax meningitis, and the spinal fluid showed a sporulating aerobe with the morphological, cultural, and pathogenic characteristics of the anthrax bacillus.

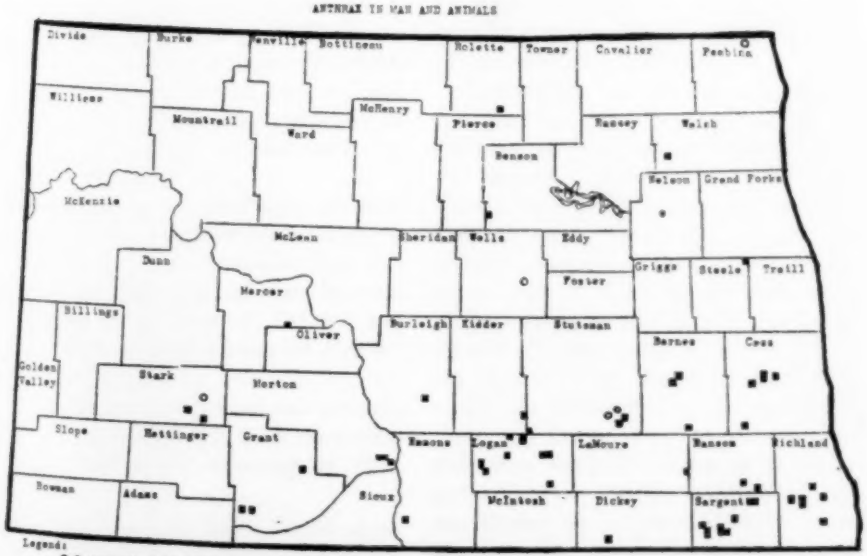
In these cases, as in Case 3, there had been no *reported* anthrax infection in cattle in the vicinity. The only other cases known in this region occurred in 1934 on a farm approximately 36 miles distant.

The implications as to human risk of these 3 cases traceable to direct contact with cattle locally produced in North Dakota depend upon the frequency and distribution of anthrax in the livestock of the state.

According to the records of the State Livestock Sanitary Board, there have been 63 instances of animal infection since 1923. Their geographic location in relation to the human cases is roughly shown in the accompanying map. It seems highly probable that a con-

North Dakota State Department of Health
Division of Preventable Diseases

ANTHRAX IN MAN AND ANIMALS



Legend:
● Geographical Distribution of Human Anthrax Cases - 1928-1939.
▮ Anthrax in Animals in North Dakota - 1923-1939.

siderable number of cases of anthrax in animals may have escaped recognition and that the picture here presented may tell only part of the story. It remains to be determined whether there are in North Dakota certain farms and localities where the pasturage and soil are contaminated with spores, giving rise to occasional infection in an animal or herd *grazing* over these areas, or whether these are traceable to contaminated feed stuffs *imported* into the state from other parts of the country. Pending more exact information regarding the source and contact of animal anthrax, recommendation of the widespread use of the more recently developed immunizing procedures for cattle hardly seems to be warranted. The public should, however, be fully acquainted with the known facts.

SUMMARY

During the past 2 years, 4 cases of human anthrax have been recognized and reported in North Dakota. One was traced to the bristles of a shaving brush imported from Japan. The other 3 were in farmers who had direct contact with locally produced infected animals.

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Hospital Morbidity Reporting*

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IF the goal of statistics of morbidity is the reporting of every case of sickness, just as the goal of statistics of mortality is the reporting of every death, we are placing before ourselves a very difficult task in the United States. It may be worth while to review the essential characteristics of reporting upon mortality and to ask in what respects the problems of reporting upon morbidity are the same, in what respects they differ.

First, there are the quantitative aspects. Mortality reporting provides a statement of the total volume of deaths in a given time and in a population of given size. It has been possible also to analyze that volume as it is affected by the related factors of age and sex, and to arrive, for comparative purposes, at the method of the refined and the standardized death rate.

Second, there are qualitative aspects. Mortality reporting provides an analysis according to cause of death. For this purpose the adoption of the *International List of Causes of Death*[1] and the *Manual of Joint Causes of Death*[2] has been essential.

Third, there are procedural aspects. Mortality reporting has been developed through compulsory reporting by physicians, through placing responsibility for enforcement of the law and for original collection of reports of death upon state and local health departments, and finally through the leadership of a federal agency, the Division of Vital Statistics in the Bureau of the Census, which has set standards, has encouraged and educated reporting agencies, has collected reports on a national scale, and has published uniform mortality statistics. A skillful combination of legal authority to require reports, an appeal to public pride, and a pragmatic use of incomplete data through the device of the registration area have done much toward completion of our mortality statistics.

Considering, on the other hand, the problems of reporting every case of sickness, we are confronted immediately by the fact that even the simplest quantitative problem, the statement of the volume of morbidity, cannot be solved because of uncertainty as to the actual fact of sickness. At what level of knowledge is the fact to be established? By the patient's own belief in his illness? or by the physician's diagnosis? As a practical matter neither of these will insure a report on the total volume of morbidity, since an unknown proportion of patients actually ill are unattended by a physician and since, on the other hand, an unknown proportion of persons who believe them-

* Read before the Vital Statistics Section of the American Public Health Association at the Sixty-eighth Annual Meeting in Pittsburgh, Pa., October 19, 1939.

selves ill are actually well. Moreover, the check on accuracy provided by post-mortem examinations is not available for morbidity statistics.

A second quantitative problem in the reporting of morbidity is determination of the degree of sickness to be considered. Is a non-disabling illness, such as a slight cold, to be counted? If not, what standards can be established for the reporting of illness?

A third quantitative problem is the question of related factors. Although the related factors of age and sex have been discovered in mortality statistics to affect profoundly any comparative statements of volume, the related factors for morbidity reporting are probably far more complicated and are still subject to considerable exploration.

In its qualitative aspects the reporting of diagnoses, or the causes of morbidity, presents some of the same technical problems as mortality reporting, but the classification of diagnoses is even more difficult than the classification of causes of death because of the higher degree of variability in the data. This is the most important aspect of the problem of hospital morbidity reporting and will be discussed later.

The procedural problems of reporting upon morbidity are no more difficult than those of reporting upon mortality except that the volume is greater. If there were sufficient public interest, physicians could be required to report; state and local agencies could be designated to enforce the law and to collect reports; a federal agency could set standards, collect reports, and publish results. A beginning already has been made in this area in the compulsory reporting of communicable diseases and certain other conditions. The most important procedural problem is to secure agreement upon a standard classification of diagnoses and to develop a technic for the statistical handling of cases with two or more diagnoses.

So far we have no plans for comprehensive reporting upon morbidity. In the absence of such plans the reporting of morbidity by hospitals may be considered as a controlled and experimental area similar to that of the reporting of communicable diseases, within which some of the technics of complete morbidity reporting may be developed. But just as the reporting of communicable diseases is in itself important, so is hospital morbidity reporting important, for it serves to establish the fact of sickness through exclusion of doubtful or unimportant cases and it provides information hitherto not available on the incidence of disease that is of unquestionable value in the distribution of hospitals and in their administration.

The crude volume of hospital morbidity is already known for many cities in the United States. In New York State the number of admissions to all public and voluntary hospitals in the state, the number of discharges, and the number of patient days are reported annually to state departments.[3] These morbidity data, however, lack the refinement of analysis by age, sex, and diagnosis. Moreover, until the number of readmissions for the same condition is eliminated the total number of admissions or discharges represents an overstatement of the volume of morbidity.

The procedure already established for this quantitative hospital morbidity reporting, however, could be extended easily in New York State to include the qualitative aspects of diagnosis, age, sex, and other important factors by requiring from each hospital an individual report upon the discharge of each patient. There is already considerable precedent and considerable experience in New York State in the collection of such reports in the fields of the foster care of children, the care of adults in public homes, and in the administration of old-age assistance, aid to the blind,

and aid to dependent children under the Social Security Act. In some of these fields the State Department of Social Welfare collects reports indirectly through the medium of county departments of welfare. In the hospital field, however, there is so far no local governmental unit designated to collect reports, and each hospital reports directly to the state.

In addition to state reports there is also precedent in New York City for reports to a local central collection agency. Hospitals that are members of the United Hospital Fund report their volume of sickness to that Fund, all voluntary hospitals receiving public charges report their total volume to the Finance Department of the city government, and all municipal hospitals (21 in number) report to the Department of Hospitals of the City of New York. These municipal hospitals report not only upon volume but also upon diagnosis. Although they are no longer published for general use, statistics upon the incidence of disease in public hospitals are available for administrative use by the Department of Hospitals.

While the procedure for collecting uniform hospital morbidity reports presents no important difficulties on the side of organization and mechanical handling, there are still difficult scientific problems to be met. Chief among these is the need for a standard classification of diagnoses for practical statistical use. Second, there is to be devised a uniform procedure for reporting, classifying, and tabulating cases with two or more diagnoses since it seems desirable not only to know the incidence of different diseases but to have a count of patients classified according to a primary or a selected diagnosis—a count unduplicated by secondary diagnoses.

The essential framework for reporting upon morbidity by hospitals may be summarized as follows:

In each hospital

1. The physician responsible for the case must enter the diagnosis on the patient's record.

2. The standard nomenclature of disease must be used for this purpose.

3. An informed and experienced medical record clerk, who has access to the physician in cases of doubt must prepare from the patient's hospital record a report on each discharged case including a statement of diagnosis. This report should include:

   a. A standard list of items about each case, such as age, sex, diagnosis, etc.

   b. An additional list of questions for selected diagnoses, such as operative procedure in surgical cases, use of radiotherapy in cancer, etc.

4. This individual report on each discharge must be forwarded to the central collecting office—city, county, state, or federal. This may be done at weekly or monthly intervals, frequently enough for the doubtful cases to be discussed between the physician and the record clerk and frequently enough to maintain an even flow of work in the central office.

In the central collecting and tabulating agency (state or local)

5. Diagnoses must be coded by informed and experienced statistical clerks.

6. A standard classified list of diagnoses for coding and classification must be used.

7. Reports of complications and secondary diagnoses must be tabulated in a standardized way.

In a federal or other agency established to set standards

8. A standard classification of diagnoses must be published.

9. Instructions for handling cases with more than one diagnosis and for securing unduplicated count of cases according to major diagnosis must be issued.

10. A standard set of tables must be constructed, including variations in correlations for particular diagnoses, such as cancer, to bring out the most important factors.

In this framework there are only two difficult problems since all of the others have been solved by the experience in mortality reporting and in the central reporting of social statistics, and since that experience is transferable. Two scientific problems remain: (1) agree-

ment upon a standard classified list of diagnoses, and (2) agreement upon procedure for handling cases with two or more diagnoses.

At least a first approximation to the solution of the problem of classifying the extremely complicated body of data presented by hospital diagnoses has been provided by the Welfare Council of New York City in *A Classified List of Diagnoses for Hospital Morbidity Reporting*,[4] the first publication of results of the Hospital Discharge Study.[5] This list is based on experience in classifying and tabulating reports upon 576,623 discharges from hospitals in New York City in 1933. Since the reasons for the classification are discussed in that publication, time will not be taken here to repeat them, except to remind you that the *Standard Classified Nomenclature of Disease*,[6] published in 1932 contains 10,000 or more separate items and therefore cannot be used for practical purposes as a stub to a statistical table. Moreover, the condensation of the *International List of Causes of Death* by the U. S. Bureau of the Census, which results in a list brief enough for statistical work, has been directed toward the classification of deaths, not toward the classification of morbid conditions in persons still alive. It is obvious that many causes of illness are not important as causes of death but may be highly important for hospital administration. The recently suggested list therefore follows the *Standard Classified Nomenclature of Disease* in terminology but reduces the list to 433 items for practical statistical use in hospital morbidity reporting, and correlates these with the *International List of Causes of Death*. The publication admits certain defects, particularly in the omission of a classification of cardiac conditions for which the hospital records were inadequate. Future experience will doubtless reveal other points at which the classification must be modified.

The second scientific problem, that of the statistical handling of cases with two or more diagnoses, has been attacked by the Hospital Discharge Study also, and at least tentative conclusions may be stated at this time.

The Hospital Discharge Study copied diagnoses that had been recorded by the hospitals during 1933 without any future statistical use in view. The *Standard Classified Nomenclature of Disease* was then in use in only 2 of the 113 hospitals, but even if the diagnoses had been stated in uniform terms there would have been certain situations that could not have been eliminated:

1. There were cases in which two or more diagnoses were entered in hospital records without any indication as to which was the reason for hospital stay, which was the primary diagnosis, which the complication, which was given treatment as an acute condition, which was perhaps ignored for the time being as a chronic state.
2. There were certain records in which the diagnostic notations were extremely numerous. Sometimes notations of mere symptoms were mingled with those of diagnoses.
3. There was another group of records in which the recording of secondary diagnoses, on the contrary, had been neglected.
4. Other records contained notations that can be explained only as a series of diagnostic guesses. The diagnosis finally settled upon, however, was given no special prominence.

The schedule originally devised in the Hospital Discharge Study for transcribing the hospital records actually provided space separately for "diagnosis" and for "complications," but it was impossible for the research staff to follow this schedule. The transcribers were not medically trained and it was necessary to impose the rule that the diagnosis must be copied exactly, faithfully, and completely. Thus, only when the hospital itself had made some distinction between diagnosis and complication or between primary and secondary diagnoses was it possible for the transcriber to turn in a completely satisfactory schedule.

The first authoritative examination of the schedules revealed an unexpected accumulation of diagnoses in certain schedules. There were not only schedules with 3 or 4 conditions but many with 5 or 6, and several with 7 to 10 or more diagnoses.

One arbitrarily chosen example will illustrate the situation as shown in the original schedules. There is the instance of the 22 month old boy who died in the hospital after a 421 day stay. The diagnosis on the discharge schedule reads as follows, word for word:

"Malnutrition; rickets; impetigo contagiosa; Little's disease; cerebral infantile paralysis; gonococcal infection; conjunctivitis; acute rhinitis; acute bronchitis; acute otitis media; broncho-pneumonia; chronic cardio-vascular disease; regular sinus rhythm; gastro-enteritis."

Our medical staff considers that the monstrosity of this so-called diagnosis is obvious. Two of the 14 "diagnoses" are different names for identical conditions (Little's disease and cerebral infantile paralysis). Several of the diagnoses are evidently superfluous. For example, the statement of an acute rhinitis or an acute bronchitis does not seem necessary when a broncho-pneumonia is reported. The statement of malnutrition is also superfluous, since a child with so many serious pathological conditions would probably be in a poor general condition. Moreover, this enumeration of "diagnoses" does not place emphasis on any of the conditions and does not give any indication of correlation between some of the recorded conditions.

The first step in the task of tabulating the discharge schedules was to reduce the number of "diagnoses," that is, to eliminate all superfluous diagnostic notations and to limit the number of diagnoses per case to a certain maximum that could be considered significant. This difficult process of reduction was placed in the hands of a group of persons with medical education and was guided by the following considerations:

1. Four diagnoses were established arbitrarily as an adequate maximum.

2. A certain number of diagnostic notations were eliminated by dropping a complicating condition that more or less regularly accompanies the major condition (examples are: cholecystitis accompanying cholelithiasis, concussion of brain accompanying fracture of skull, acute purulent otitis media accompanying acute mastoiditis, etc.). Or typically secondary conditions could be dropped regularly, such as secondary anemia, secondary hemorrhage, malnutrition, etc. Common cold was regularly dropped when associated with another disease.

3. A certain number of other diagnostic notations were eliminated by combining several manifestations of the same etiology under one unitary diagnosis—for instance, tabes dorsalis plus aneurysm under general syphilis, laryngitis plus rhinitis under common cold, etc.

4. In cases where these and similar rulings did not succeed in reducing the number of items sufficiently a further reduction was achieved by eliminating individual diagnostic notations that in the particular combination of diagnoses seemed of least importance. This decision as to preference for various elements of a combined diagnosis was made in accordance with the listing of the *Manual of Joint Causes of Death*.

The combination of all these procedures reduced the number of diagnoses on each schedule to a workable number, not exceeding 4 in any case. The final tabulation showed that in 78 per cent of the records a single diagnosis had resulted from this process, in 17 per cent 2 diagnoses had been retained, in 4 per cent 3, and in only 1 per cent of the cases were there 4 diagnoses that were both sufficiently important and sufficiently independent to be retained.

Critical examination of these figures immediately raises the question whether they reflect the true situation. This question must be answered in the negative. The reason is that numerous records did not contain any notation of additional diagnoses and it is certain that many noteworthy diagnoses remained unrecorded. A comparative

study of the records of different hospitals gives interesting documentary material indicating that different hospitals handled the notation of secondary diagnoses, apparently arbitrarily, in very different ways. For example, one hospital with 1,025 deliveries reported only 3 cases of toxemia of pregnancy, while another with 1,285 deliveries reported 103 cases. It is easy to understand that there was no uniform practice in reporting slight conditions such as laceration of the perineum, but it is hard to understand why the recording of a condition of such vital importance as toxemia of pregnancy was handled in such different ways.

In the Hospital Discharge Study it was impossible to supply the lacking information. To interview the attending physician after so long a time had elapsed would have been impossible. The cases were tabulated after careful scrutiny, but it must be admitted that the figures for the occurrence of cases with one, two, or more diagnoses are probably too low, and the total figures for the occurrence of certain diagnoses in the *Classified List of Diagnoses for Hospital Morbidity Reporting* must be likewise considered too low.

Two tabulations were necessary, one to supply data on the incidence of various diagnoses and the other to count patients once, according to the most important condition. The first of these, already published, tabulates every condition (after elimination of those beyond the fourth) regardless of the number of times the patient is counted. Thus there result more than 750,000 diagnoses for 576,623 discharges.

The second tabulation, not yet quite complete, is referred to as the "unduplicated count" and includes a patient only once, classifying him according to the condition that seemed most likely to be responsible for his hospital stay.

The choice of diagnoses for this unduplicated count of patients was based on the general idea that in each combination of acute and chronic conditions the acute must be considered as the element that is responsible for the particular hospital stay in question. The following preference list resulted from this principle: Delivery takes first place, followed by traumatic conditions, infectional hypertrophy of tonsils and adenoids, acute infectious diseases, etc.

Although it is inevitable that the practical application of such arbitrary rules results in certain inaccuracies, it can be assumed that in the majority of cases the decisions are correct. It must be remembered that the number of cases in which the rule was to be applied constituted only 22 per cent of the cases. Moreover, the first three items on the preference list—deliveries, newborns, and tonsils—accounted for 180,000 of the half million discharges. Therefore, it is probable that the cause of hospital stay is fairly obvious in a large proportion of the total.

For the success of future hospital morbidity reporting, however, the use of such arbitrary rules should be rendered unnecessary through the construction of a schedule with special rubrics for the various kinds of additional conditions. The very presence on the reporting schedule of precisely designed rubrics may prevent significant diagnoses from being omitted and qualitatively different categories of diagnoses from being confused. Such a schedule presumes coöperation between the attending physician and the medical record clerk since the adequacy of the report will be limited by the physician's original record of the case and the clerk's ability to transcribe it on the schedule.

The use of an elaborated schedule also requires careful definition and delimitation of the several categories of diagnoses that are to be reported. Particular emphasis must be given to the "major diagnosis," which may be de-

fined as the condition responsible for the admission to and treatment in the hospital and which appears, from experience in the Hospital Discharge Study, to be the only diagnostic information that can be used when an unduplicated count is intended.

To the objection that general knowledge about morbidity will be unduly limited if the tabulation is limited to the cause of hospital admission, let me remind you that a second tabulation may be made in which all reported diagnoses are included. But even for this second tabulation, differentiation in diagnoses as to quality is important. It is suggested from experience in the Hospital Discharge Study that additional diagnoses be differentiated in three groups, namely, (1) complications, (2) accessory conditions, and (3) chronic states. Detailed definitions of these different categories of diagnoses will be suggested in the final report of the study.

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MEDICINE AND PUBLIC HEALTH BUILDING AT NEW YORK WORLD'S FAIR

UNDER the direction of the American Museum of Health, the Medicine and Public Health Building will continue for the 1940 season at the New York World's Fair when it opens on May 11. Dr. Louis I. Dublin, Acting Chairman of the Board of Directors of the Museum, has announced that negotiations have been completed for the operation of the building by the Museum. This leadership assumes the maintenance of the high standards of scientific authenticity and the freedom from commercial exploitation which characterized the exhibits in this building last year. That such an idealistic program met with popular approval is attested by the fact that over 7,500,000 visitors were clocked entering the Medicine and Public Health Building last season. That the plan was equally successful in winning the approval of the commercial and non-commercial organizations, whose sponsorship of exhibits made possible the presentation, is apparent from the enthusiastic assurances of a majority of these groups that they will participate in the 1940 exhibition.

The unprecedented success of this experiment in public health education gives renewed courage to all educators, demonstrating as it does the desire of the public for knowledge. In competition with lavish displays and elaborate extravaganzas of the country's largest industries, these purely educational exhibits attracted one out of every three visitors to the World's Fair.

Many phases of activities in the public health field were dramatized for the lay public, introducing for the first time to many visitors methods in the control of communicable diseases, the necessity for milk and food control and an especially interesting development in a new field of public welfare—housing for health developed under the direction of the Association's committee on The Hygiene of Housing.

"Your Health Department Protects Your Family," the exhibit sponsored by the American Public Health Association, provided the public with facts about the protectors of their health and welfare, and proved to be a source of help and inspiration to health workers from all parts of the United States and Canada.

Demonstrations in the control of communicable diseases in the home which were a feature of this exhibit made it one of the most popular attractions in the hall. During one week nearly 18,000 people attended these demonstrations. They were presented through the coöperation of the Visual Education Project of the National Youth Administration.

With the experience of last season as a guide, plans for the further improvement of the exhibit in 1940 have been made. Those interested in public health, in education, in social service work, in medicine, dentistry, and all their allied fields, may confidently expect again to find the Medicine and Public Health Building at the New York World's Fair in 1940 a brilliant demonstration of mass health education.

DENTAL HEALTH

DENTAL health, entirely apart from dentistry as a profession, is coming to be recognized as worthy of consideration from every standpoint. Recently off the press is a *Public Health Bulletin* [1] giving a very short history of the development of this line of work which began only in 1918 in this country, and a list of the state departments of health which have dental health organizations. There have been many independent investigations, books written on the subject, courses introduced into some medical schools,[2] and in our own Association, the development of a dental health group which has given us valuable aid.

Virginia was first (in 1916) to appoint a dentist on the State Board of Health. Dental health work was initiated in 1918 by the State Board of Health of North Carolina. Allotments under the Social Security Act, in 1935, led to greatly increased activity, so that by July, 1938, there were 35 state departments of health with dental services.

On this general subject another most interesting report comes to us [3] which, as far as it goes, upsets to a certain extent ideas which have become rather firmly implanted.

The term "socio-economic" has been applied to factors which unquestionably influence public health in many ways, and it is correctly pointed out that practical programs based on correct appreciation of these factors have done much for the reduction of morbidity as well as mortality from certain diseases.

To determine the influence of community socio-economic conditions on the incidence of dental caries, a study has been made of some 200,000 children in 40 urban communities in New Jersey living under fairly representative conditions. While some of the basic data are not entirely satisfactory, many are sufficiently precise for the purpose of analysis and evaluation. A rather ponderous term, "odontothanatotic" has been coined for use in this connection, the odonothanatotic rate being the number of permanent teeth extracted and indicated for extraction per 100 children.

The conclusion is reached that the care of the teeth as indicated by fillings in permanent teeth is highly but inversely correlated with the deaths and extractions of teeth, hence the odontothanatotic rate is a rough measure of the relative amount of dental care received by children. Those with low odontothanatotic rates are characterized as a rule by relatively high levels of dental care and, conversely, while a high odontothanatotic rate means a low filled tooth rate.

The general conclusion of this extensive study which is, however, regarded as preliminary, is that the economic status of the community bears little relationship to the tendency of the children to suffer from caries in the permanent teeth, but there is an intimate relationship between economic status, the volume of dental care, and the total number of permanent teeth extracted or indicated for extraction. However, the number of permanent teeth extracted or indicated for extraction, which is a rough measure of the level of dental care, is not a precise measure of efficacy or volume of such care.

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TYPHUS AND ROCKY MOUNTAIN SPOTTED FEVER IN THE EASTERN UNITED STATES

NOT so long ago, when one thought of typhus in this country he had in mind Brill's Disease as found rarely, and then in only a few of the larger cities. At about the same time Rocky Mountain spotted fever was considered as being confined to Montana and perhaps to the neighboring states. In the light of the work of Goldberger, Maxcy, and others, typhus began to be recognized as an important factor in morbidity in the southeastern states. It was the occurrence of this so-called typhus (or Brill's Disease) in the eastern seaboard states that gave Dyer and his associates in the U. S. Public Health Service an opportunity to show that in eastern Maryland and Virginia the typhus cases could be divided into two categories—typhus fever, and a condition somewhat similar clinically. By a series of brilliant observations these workers proved the latter entity to be identical with, or, at most, a variant of the spotted fever of the Northwest, and it was designated " the eastern variety of Rocky Mountain spotted fever." Tabulated in parallel columns, the clinical differences between the two infections seem clear, and it would appear that a diagnosis could readily be made; actually, at the bedside the distinction is sometimes difficult, and laboratory tests ordinarily applicable may still leave the physician in doubt. Even in the field of histopathology differences in experimental animals are quantitative rather than qualitative. In some instances the distinction between the two clinical entities is to be made with certainty only in a laboratory equipped to carry out cross-immunity testing.

An important, but not very helpful, distinction may be made according to the outcome of the case; if fatal, spotted fever (eastern type) is probably the correct diagnosis, as typhus has a very low mortality as against a 20 to 25 per cent death rate for eastern Rocky Mountain spotted fever.

Both typhus and eastern Rocky Mountain spotted fever are now known to be widely distributed; whether they are only recently being recognized in larger geographic areas or whether there has in reality been an extension of the two infections cannot be decided with any degree of certainty. Both diseases have rather striking clinical features so that it is difficult to believe that either would long be overlooked if present in a community to any considerable extent.

Theoretically, both these infections are readily amenable to public health preventive measures, rats (and possibly other rodents) constituting the effective

reservoir of endemic typhus virus, and the common eastern tick being the host of Rocky Mountain spotted fever (eastern type). It is doubtful that preventive measures are often practicable; rat control means sustained expensive efforts that require the utmost in the way of community support, including effective enforcement of rodent control measures, particularly rat-proofing. Whether or not the menace is sufficient to warrant this on a scale that would probably be effective is doubtful. In spotted fever the problem, viewed from the public health aspect, is even more difficult; as is well known, the infection of man is almost invariably from ticks, but in this case there is no demonstrated mammalian host that could be named as the weakest link in a chain, and it goes without saying that we have no means of control of the tick population. In the eastern areas the incidence of spotted fever is hardly high enough to warrant the recommendation of widespread use of the vaccine that has been found useful in the western areas where the incidence of the disease is much higher.

There is of course always a possibility that endemic rat-flea transmitted typhus may become epidemic through louse human-to-human transference. Thus far it appears not to have occurred in the United States; probably it is not likely to occur on any dangerously large scale since infestation with human body lice seems to be rather infrequent at the present time. If an epidemic of louse-borne typhus threatened, doubtless it could readily be controlled through the utilization of the facilities of existing or improvised laundry and dry-cleaning plants.

HEALTH BROADCASTS

YOUNGEST among public health education media, the radio seems to us to be still in the trial and error stage of development. The coast-to-coast health broadcasts of the U.S.P.H.S. and of the A.M.A. have put the air lanes to impressive use. Smaller organizations attacking community health problems through local or regional air channels have contributed experimental programs as varied as the Philadelphia Health Council's Musicale with its pithy intermission commentary, the New York State Department's dramatic episodes in "Utopia," the Los Angeles maternity discussions in forum style, and the usual straightforward lecture.

By what technics can radio at once attract listeners and influence their behavior? To what extent can unsolicited aural information affect morbidity and mortality? Does a popularized broadcast, employing extrinsic motivations for learning, lose its educational force?

To the extent that we accept mass education as a factor in health promotion at all, we must assume aural learning from the loudspeaker to have an effect on the public health. How much of this effect is to rest with the advertisers of foods and proprietary medicines may depend in part upon the comparative listener-interest and persuasiveness of counterpropaganda by noncommercial health broadcasters.

Such efforts require constant repetition, easily accomplished on the weekly radio program. The listener receives the information effortlessly, without cost, and often without interruption of his household chores. Understood even by the illiterate, and penetrating homes that are never represented at community meetings, radio ought to be an invaluable health education tool in hands that know how to use it.

Apparently, what is needed is a form of showmanship that will attract audiences without overshadowing the scientific material presented. If extrinsic motivations for learning could serve not merely to sugar-coat the factual information but actually to point up the educational purposes of the broadcast, popularization itself would assist the educative processes.

Of recent health broadcasting efforts to combine audience-appeal with education, the Illinois State Department's 15 minute transcribed dramatic series is an interesting illustration.

To achieve state-wide coverage the broadcasts had to be so designed as to merit "sustaining" air time from a considerable number of independent radio stations, whether these were small or large, college-owned or commercial, within the borders of the state or just outside.

Released in the fall of 1938, the early productions were necessarily more or less experimental. From them has come a custom-built radio health education technic eminently successful in at least its first objective, that of gaining audiences in all parts of the state and at all social levels. Listener replies have come in from residents of prominent Chicago hotels as well as from farmers and from recipients of public assistance. The number of coöperating radio stations has grown from 18 to 30, increasing the total amount of time on the air weekly from 4½ to 7½ hours.

The dramatic formula of the programs is not complicated. The listener's attention is won at the opening of the playlet rather by an arresting plot situation than by a hackneyed or mentally unhygienic appeal to the fear of disease. Instead of objectively dramatizing isolated historical facts or illustrative therapeutic incidents the series presents vivid fiction in realistic contemporary settings so as to encourage listeners to identify with the protagonists. Hearing such a broadcast may well be a vital emotional experience because of which the clever solution will not easily be forgotten.

There are probably as many effective methods for adapting health education to the medium of radio as there are resourceful and ingenius health educators to do it. Health broadcasts all over the country are increasingly worthy of our best efforts and attention.

THE CRISIS IN HOUSING

UNDER the preliminary program of the PWA 51 "Better Housing" projects were built in 35 cities, and during the past two years 347 more projects have been initiated in 155 communities. Homes for 130,000 families now living in substandard dwellings will be provided under approximately $582,000,000 of loan contracts involved. This whole program is designed primarily to meet a health objective, interpreting health as we do today in terms of mental and social health, as well as in terms which include the sanitary and physiological relations of the physical environment. Furthermore, the health officer has a direct interest at stake. The selection of a site for a new housing project, the health values involved in construction and management, the selection of tenants on the basis of their habitation of substandard dwellings—all these are matters on which the health officer has or should have special competence. Furthermore, in the contract between the local housing authority and the USHA, it is provided that for every new dwelling unit built, one existing substandard dwelling unit in the city

must be demolished or rehabilitated. Every health officer knows that in the past the letter of the building code and the sanitary code could not be strongly and universally enforced without serious hardship on account of the lack of suitable dwellings to which tenants might be moved. The present housing program frees his hands at last and opens enormous possibilities for the elimination of the worst slum conditions.

In such cities as Baltimore, Chicago, Detroit, Memphis, New Haven, Newark, and Washington, the rôle played by the health department has been a particularly active one. In every city of the United States, however, whether a housing program is as yet in force or not, the health officer is interested in the continuation of this significant and promising program. It is of the utmost importance therefore that the present Congress should do what the last Congress failed to do—provide for the continuance of the program of the USHA and make adequate financial provision for its support. We have as yet only made a beginning in the vital task of housing reform carried on so successfully by such countries as England, Sweden, and Holland during the past quarter century.

BOOKS AND REPORTS

Books of Special Interest to Public Health Workers

MAZÝCK P. RAVENEL, M.D.

"Some books are to be tasted, others to be swallowed, and some few to be chewed and digested."—Bacon.

AGAIN we have gone over the books which have become available in the past year and selected those which we believe are of especial use to our readers interested in some branch of public health. As in the past, the basis of selection has been the reviews found chiefly in the *American Journal of Public Health*, the *Journal of the American Medical Association*, *The London Lancet*, and the *British Medical Journal*. The short comments are taken almost word for word from the reviews which are supposed to have been written by specialists and experts.

CHILD HYGIENE

During the past year, as always, children and their training have occupied a great deal of attention. Nevertheless, notable books on the subject are few. Among these are: *Babies Are Human Beings*, by C. Anderson Aldrich and Mary M. Aldrich, Macmillan, which is charmingly written and a book which physicians, nurses, and parents should read. *Your Baby and Child*, by M. C. Overton, Your Baby & Child Publishing Co., is a book for mothers, written in simple language, and answers all questions an intelligent mother might ask. The advice given is sound, following modern pediatric practice. *Nursery School Education*, by Josephine C. Foster and Marion L. Mattson, Appleton-Century, is based on years of personal experience and stands out as a source book—readable and suitable for lay as well as professional readers.

SOCIAL HYGIENE

This subject in one form or another has been much to the fore, but material on it has been confined chiefly to the venereal diseases. A valuable book, *The Social Work Year Book, 1939*, Fifth Issue, edited by Russell K. Kurze, Russell Sage Foundation, is necessary for the reference shelf—even more helpful than its very useful predecessors. *Medical Information for Social Workers*, by William M. Champion, Wood, is intended to enlighten beginners in social work though useful for all classes, with 9 chapters giving medical information in the medical specialties. The information has been gathered by the author of the book and 8 coworkers from the Faculty of Western Reserve University School of Medicine—an excellent presentation. *Population, Race, and Eugenics*, by Morris Siegel, published by the author, Hamilton, Ont., is a good discussion

for the lay reader by a physician, highly recommended for those who wish a sound yet simple exposition of the eugenic question.

INDUSTRIAL HYGIENE

The past few years have seen a marvelous expansion in new chemical products, almost all of which have practical application in industry so that many novel problems in the conduct of factories and the toxicology of the new products have come up, most of which have not yet found their way into permanent literature. The following books are of especial value: *Toxicity of Industrial Solvents: Summaries of Published Work,* compiled by Ethel Browning, Chemical Publishing Co. of New York, Inc., the first American edition of Report No. 80 of the Industrial Health Research Board—a valuable book, thorough, careful, and up-to-date, with a full bibliography and satisfactory index; *Silicosis and Asbestosis,* by various authors, edited by A. J. Lanza, Oxford University Press, a summary of our knowledge on silicosis and asbestosis, subjects which are recognized as most important in industrial hygiene, not only from the fundamental medical and engineering standpoints, but also from the economic and compensation point of view; *Carbon Monoxide Asphyxia,* by Cecil K. Drinker, Oxford University Press, a standard book by one who has devoted many years to the study of "the most widespread poison connected with human life and activity since the first discovery of fire."

MENTAL HYGIENE

Mental hygiene continues to advance and those interested in it have shown considerable activity. Among the excellent books are *Emotional Hygiene: The Art of Understanding,* by Camilla M. Anderson, Lippincott, one of the finer examples of popular treatment of mental hygiene, useful for public education in this important subject. *A Biological Approach to the Problem of Abnormal Behavior,* by Milton Harrington, Science Press Printing Co., an earnest effort to simplify to the average mind the mental processes by reducing them to a more concrete formula in physiological terms. *The Mental Hygiene Movement from the Philanthropic Standpoint,* Department of Philanthropic Information, Central Hanover Bank and Trust Company, is the best presentation of the mental hygiene movement for the layman that we know of, interestingly written, easily read, and free from the technical language which has puzzled and antagonized the layman. *Hereditary and Environmental Factors in the Causation of Manic-Depressive Psychoses and Dementia Praecox,* by Horatio M. Pollock, Benjamin Malzberg, and Raymond G. Fuller, State Hospitals Press, is readable and well planned. It should receive a warm reception from all interested in the progress of mental hygiene from its present status to one in which prevention of mental disease will take its proper place. *Man Against Himself,* by Karl A. Menninger, Harcourt, Brace, is an elaborate thesis by the brilliant author of *The Human Mind,* a best seller among the many lay treatises on the new psychologies, the upshot of which, based on Freud's concept of the death instinct posed against that of self preservation, is that man is his own worst enemy, an interesting hypothesis that stands or falls with the body of psychoanalytic doctrine. A monumental book, a review of which has been delayed, but which must be mentioned, is *Mental Health,* a publication of the American Association for the Advancement of Science, No. 9, being a symposium under 8 heads, which one can safely say cover practically every aspect.

HEALTH EDUCATION

We have included under this heading books which might have been placed in other categories, so our selections may be somewhat open to criticism. However, we call attention to books that should be read: *The School Health Program,* by C.-E. A. Winslow, McGraw-Hill, while a study made of conditions in New York, the experience in that state will be useful to others in working out similar problems elsewhere. *The Health of College Students,* by Harold S. Diehl and Charles E. Shepard, American Council on Education, is a report to the American Youth Commission of the American Council on Education, one of the first books of its kind calling attention to a much neglected subject, the health of college students. *Man and His Health,* Exposition Publications, Inc. (New York), is interesting in view of the prospect that the New York World's Fair will be continued in 1940, especially for those who look forward to visiting the exposition. *Man Against Microbe,* by Joseph W. Bigger, Macmillan, is an excellent book for the general public which should be in all libraries. Dr. Bigger, a professor at the University of Dublin, is the author of one of the most widely used textbooks on bacteriology.

NUTRITION

Some valuable textbooks on this subject have appeared, mostly new and revised editions. Valuable and unusual in its presentation to the public is *Foods: Production, Marketing, Consumption,* by Jean J. Stewart, Prentice-Hall. From production in the field to table etiquette, this book is replete with information of real value to health officers, physicians, nurses, dieticians, and food technologists, through education which tends to make life more interesting and efficient. Others which deserve mention are: *Nutrition,* by Margaret S. Chaney and Margaret Ahlborn, Houghton Mifflin, a well organized book the authors of which have overcome some of the failings of similar texts. It deserves a place in the reference libraries of doctors, nurses, dieticians, and other nutritionists. *Nutrition and Physical Degeneration: A Comparison of Primitive and Modern Diets and Their Effects,* by Weston A. Price, Hoeber, is an impressive book with an enormous amount of information on a much debated question. It can be read with advantage by all, even if the conclusions are not accepted. *The Newer Knowledge of Nutrition,* by E. V. McCollum, Elsa Orent-Keiles, and Harry G. Day, Macmillan, is a well known book brought up to date and will be welcomed by all. *Appertizing or The Art of Canning,* by A. W. Bitting, The Glass Packer, is the only book of its kind in the field giving the history, laws and practical application of canning. It is recommended without hesitation to all workers in the field of public health as a reliable reference.

LABORATORY

As usual, a great deal has been written concerning laboratory work, as the discoveries there made are fundamental to practical application. The following books may be mentioned: *A Fundamental Approach to Bacteriology,* by Courtland S. Mudge and Floyd R. Smith, J. W. Stacey, is a laboratory manual of unusual type which can be recommended for the purpose for which it was designed. *The Etiology of Trachoma,* by Louis A. Julianelle, Commonwealth Fund, is a book of great interest for those who are attempting to follow the expanding area of the virus infections. *A Manual of Veterinary Bacteriology,* by Raymond A. Kelser, Williams & Wilkins, is the outstanding book on veterinary bacteriology in this country. *Big Fleas*

Have Little Fleas, or Who's Who Among the Protozoa, by Robert Hegner, Williams & Wilkins, is a new type of text which holds the attention of laymen as well as scientists, containing lots of humor and much good sense. *Medical Entomology,* by William B. Herms, Macmillan, is a valuable reference for practising physicians, teachers, and students of medical entomology which should be found in every medical library. *Veterinary Helminthology and Entomology,* by H. O. Mönnig, Wood, can be thoroughly recommended as a working manual, especially for veterinarians. *Fundamentals of Dentistry in Medicine and Public Health,* by John Oppie McCall, Macmillan, is an enlargement of the "Primer" by the same author which was quite successful. It is useful, stated in clear language, containing a vast amount of important information, and can be recommended for both professional and lay readers. *Immunity Principles and Application in Medicine and Public Health,* by Hans Zinsser, John F. Enders, and LeRoy D. Fothergill (5th edition of *Resistance to Infectious Diseases*), Macmillan, is an excellent example of a critical treatise expanded to include chapters that correlate the principles revealed in the laboratories and their application to the clinic and public health.

ENGINEERING

An outstanding work is: *Modern Sewage Disposal,* edited by Langdon Pearse, Federation of Sewage Works Associations. This is a notable volume commemorating the 10th anniversary of the founding of the Federation of Sewage Works Associations, an excellent volume of reference for historical research in sanitary engineering, a text on sewage disposal, and a disposal plant operator's manual. *Water Supply Engineering,* by Harold E. Babbitt and James J. Doland, 3rd edition, McGraw-Hill, is brought up to date and fulfils the purpose for which it was intended adequately and well.

TEXTBOOKS

The year has brought out many excellent textbooks and a number of revisions, some of which have been so extensive as to be practically new. *Essentials of Medicine,* by Charles P. Emerson and Nellie Gates Brown, 13th edition, Lippincott, is intended especially for nurses and rewritten in accordance with suggestions in *Curriculum Guide for Schools of Nursing* of the National League of Nursing Education. *A General Textbook of Nursing,* by Evelyn C. Pearce, Dutton, is richly illustrated and an excellent reference book for schools of nursing and for nurses in general practice. *Military Preventive Medicine,* by George C. Dunham, *Army Medical Bulletin No. 23,* Medical Field Service School, is recommended unreservedly. *Nurses Handbook of Obstetrics,* by Louise Zabriskie, 5th edition, Lippincott. It is difficult to conceive of a more comprehensive or complete guide in this important field. *A Textbook of Orthopaedic Nursing,* by Evelyn C. Pearce, Faber and Faber, Ltd., is a standard book recommended not only to nurses in training but to social workers, physical trainers, and physiotherapists. *A Synopsis of Hygiene,* by Sir W. Wilson Jameson and G. S. Parkinson, 6th edition, J. & A. Churchill, Ltd., is a standard in England though there are some drawbacks (nomenclature, laws, etc.) as far as its usefulness in America goes. *A Textbook of Applied Microbiology and Pathology,* by Thurman Rice, 2nd edition, Macmillan, contains considerable additional material presented in interesting style, and will continue to hold its high place among texts of this type. *Pulmonary Tuberculosis in Adults and Children,* by James Alex-

ander Miller and Arvid Wallgren, Nelson, is an interesting and accurate presentation of the pathogenesis of tuberculosis, based on articles from *Nelson Loose-Leaf Medicine*. *The Biology of Bacteria: An Introduction to General Microbiology*, by Arthur T. Henrici, 2nd edition, Heath, is a valuable book brought up to date and increased in size by 22 pages. *A College Course in Hygiene*, by K. Frances Scott, Macmillan, is written by the Associate Professor of Hygiene at Smith College and the book is addressed to girls. It is excellent in every respect in the field for which it was designed. *Text-Book of Meat Hygiene: With Special Consideration of Antemortem and Postmortem Inspection of Food-Producing Animals*, by Richard Edelmann, Lea & Febiger, is one of the standard books of the world brought up to date and recommended without reservation. *Avian Tuberculosis Infections*, by William H. Feldman, Williams & Wilkins, is an excellent study of avian tuberculosis, the increasing importance of which is being recognized not only on account of transmission of the disease to swine, but also because it seems to interfere with the standard tuberculin test in cattle. *Manual of Public Health: Hygiene*, by J. R. Currie, Wood, is an excellent and precise volume with a very useful chapter on international health relations, explaining the spread of disease by modern transportation facilities and being so modern that there is a chapter on "Air Raid Precautions." *Reference Handbook for Nurses*, by Helen F. Hansen, Saunders, is a welcome and valuable aid to the public health nurse, with particular emphasis on the preventive aspects of nursing and of the opportunities which a nurse has as a health teacher.

VITAL STATISTICS

What has become of the vital statisticians? Not one book on this subject has been sent in to us for review nor have we been able to find the notice of one in the index of the *Journal of the American Medical Association* for 1939. We have failed also to find any book on the subject listed in the first volume of 1939 of *The Lancet* and the *British Medical Journal*. Consultation of the *Quarterly Cumulative Index* also has failed to give us any help.

HISTORY AND AUTOBIOGRAPHY

A very unusual book is *The Life of Chevalier Jackson: An Autobiography*, Macmillan. It is a human document of rare interest by the man who invented the means of saving hundreds of people, mostly children, from suffering and death. It deserves a place in all private and public libraries, medical and lay. *William B. Wherry—Bacteriologist*, by Martin Fischer, Thomas, is a labor of love telling the story of one who is noted for his achievements and loved for his personal qualities. The author has rendered a service in making this history available to the wide circle of Dr. Wherry's admirers and friends. *Sir Thomas Roddick*, by H. E. MacDermot, Macmillan Company of Canada, is the story of one of the outstanding figures in the medical life of Canada who taught hygiene in the Faculty of Medicine at McGill University. *Fighting for Life*, by S. Josephine Baker, Macmillan, an interesting autobiography of a pioneer, while marred by some inaccuracies, is well worth while in spite of them. *Medicine in Modern Society*, by David Riesman, Princeton University Press, is a sane and thoughtful book, the sort of work which should be made a part of the training of all well educated citizens. *The History of Bacteriology*, by William Bulloch, Oxford University Press, is easily the best work in this much neglected field. It is founded on

the Heath Clark Lectures for 1937, and should be required reading for all students of bacteriology. *Lillian Wald, Neighbor and Crusader,* by R. L. Duffus, Macmillan, is a picture of the great personality who was founder of the Henry Street Settlement. *The Story of Surgery,* by Harvey Graham, with a foreword by Oliver St. John Gogarty, Doubleday, Doran, is an unusually interesting book which gives much history with an abundance of human nature, humor, and philosophy.

GENERAL

Under this heading we place a number of books which could well go under other classifications. It is often hard to classify rigidly. *Sulphanilamide Therapy of Bacterial Infections,* by Ralph R. Mellon, Paul Gross, and Frank B. Cooper, Thomas, is an excellent review of earlier literature and the chemistry and pharmacology of the sulfanilamide compounds. *Gould's Pocket Pronouncing Medical Dictionary,* by George M. Gould, 11th edition revised by C. V. Brownlow, Blakiston, is a book the usefulness of which has been long established and the revision well done. *Sanitization of the Drinking Glass:* Part One, Methods and Procedures, by Jack G. Baker; Part Two, Practical Control, by Raymond V. Stone, National Association of Sanitarians, Inc. (Los Angeles), is a concise, comprehensive and dependable guide for health officers and sanitary inspectors. It can be recommended without qualification to all interested in this important movement. *Landmarks in Medicine,* Laity Lectures of the New York Academy of Medicine, Introduction by James Alexander Miller, Appleton-Century, is largely historical with application to present-day problems. It ranks among the best of this series. *Classic Descriptions of Disease,* by Ralph H. Major, Thomas, is a necessary book for all medical libraries and recommended for all others and is a mine of information on the history of medicine. *Health at Fifty,* edited by William H. Robey, Harvard University Press, is a useful and authentic book deserving a place in every public library. The title is somewhat misleading. Since health at the age of 50 implies the best care all during childhood and adolescence, these lectures, sponsored by Harvard University, are devoted to that early period of life. *The Anaerobic Bacteria and Their Activities in Nature and Disease: A Subject Bibliography,* by Elizabeth McCoy and L. S. McClung, University of California Press, is a monumental subject bibliography which has been praised everywhere. *Medical Vocabulary and Phrases: English, German, French, Italian, Spanish,* by Joseph S. F. Marie, Blakiston, is more useful in writing and preparing papers than for translation, since the rendition is from English into the other languages. *Alcohol: One Man's Meat,* by Edward A. Strecker and Francis T. Chambers, Macmillan, is an instructive, scientific and practically useful interpretation and evaluation of the why's and wherefore's of drinking and of the psychiatric approach to its management and control. Education for temperance is the ultimate, rational answer. *The Canned Food Reference Manual,* American Can Company, is a striking example of enlightened advertising, well documented and illustrated, and containing a wealth of useful information. *Health Officers' Manual,* by J. G. Geiger, Saunders, is a convenient summary of the service of one of the best health-administered cities, which lay groups of teachers and social or welfare workers on the west coast will find useful. *Community Health Organization,* Ira V. Hiscock, 3rd edition, Commonwealth Fund, is a thoroughly revised and up to the minute edition of a book which gained the front rank

from the beginning. It will be welcomed by all of those who work in the field of public health. *Your City,* by E. L. Thorndike, Harcourt, Brace, is a rating of 310 of the larger cities in the United States with standards for appraisal, and contains a great deal of valuable advice for those who would improve their city. *The Administration of High School Athletics,* by Charles E. Forsythe, Prentice-Hall, contains much valuable information for all, who either from the health viewpoint or that of education are concerned in the administration of secondary schools. The text was badly needed in that field. *Public Health Law,* by James A Tobey, Commonwealth Fund, is entirely rewritten and expanded, a "must" book for all engaged in public health whether administrator, educator, lawyer, or sanitary officer. It discusses the powers and duties of health departments, liability, legislation, and law enforcement. *Oh, Doctor! My Feet!,* by Dudley J. Morton, Appleton-Century, is on a subject which interests everybody and is more important than many realize. This book is a prophylactic against much lay advertising, and can be read with profit by physicians as well as laymen. *Marihuana: America's New Drug Problem,* by Robert P. Walton, Lippincott, is an authoritative discussion of this plant about which there is still much uncertainly as well as ignorance. It is unquestionably a danger, particularly to our youth, and this is a discussion of the facts and methods of control.

Much consideration has been given to this selection, and we trust it will be of real value. It must be remembered that further information can be obtained from our Book Service Department in the office in New York. We are always glad to respond to inquiries concerning books in general as well as those designed for special interests and professions.

A Mirror for Surgeons: Selected Readings in Surgery—*By Sir D'Arcy Power. Boston: Little, Brown & Co.,* 1939. 230 pp. Price, $2.00.

This delightful book of selected readings by great surgeons of the past has biographies of 22 men who have contributed to the advancement of surgery. Only one Frenchman, Ambroise Paré, is mentioned, and three Americans.

As far as the selection of English surgeons goes, there is no one more fitted to do this than the author, owing to his long association as Honorary Librarian of the Royal College of Surgeons and his literary work in revising and editing several monumental works and his biographies of surgeons in the *Dictionary of National Biography.* He also wrote the *Life of William Harvey,* and is now the Dean of British surgeons.

No fault can be found with the selection he has made of American surgeons as far as they go, though we might wish to see a few more names added; for example, that of McDowell. The sketch of Marion Sims is deficient and also confusing as to his education and moves. He was a student in the Medical College of the State of South Carolina for a year and got his degree finally from Jefferson Medical College in 1835. He settled in Lancaster, S. C., and in 1840 established himself in Montgomery, Ala., going to New York in 1853. This is important, as his creative work, such as the invention of the speculum, and the repair of vesicovaginal fistula, took place while he was in Montgomery.

The author makes the mistake, so often corrected, of saying that Warren was first, in 1846, to operate using ether anesthesia. The credit belongs to Dr.

Crawford W. Long, of Athens, Ga., who used ether as a surgical anesthetic in 1842.

The book is full of interest from cover to cover, constantly reminds us of what we owe to the great men of the past, and emphasizes the importance of studying medical history. There is a good introduction by Francis R. Packard which will be useful to the average American reader. It is a book which should be found in every medical library, and would not be out of place in a general library.

MAZŸCK P. RAVENEL

Child Training and Parent Education: References to Material in Recent Books—*By Lucile Reiner Stebbing and Caroline Shurtleff Hughes (2nd ed.). New York: H. W. Wilson Co.*, 1939. 83 pp. Price, $.90.

The references in the revised edition, *The Index on Child Training and Parent Education,* are in keeping with the newer trend in education, i.e., toward a consideration of the "whole child" in all of his relationships. Probably the most significant is that between himself and his parents, and much of the material in this reference book is centered around that parent-child relationship.

All of the books listed are from those published in the last 15 years, and the majority have been written in the last decade. The books in this compilation have been well chosen from among the vast amount of literature on the subject of child training and parent education, and the index should be of practical help to all who use it.

ETHEL GORDON

Nursing in Sickness and in Health: The Social Aspects of Nursing—*By Harriet Frost. New York: Macmillan*, 1939. 217 pp. Price, $2.00.

This book describes the way in which the health and social aspects of nursing are incorporated into the curriculum at the New York Hospital School of Nursing. "The first part deals with the general philosophy which should permeate every course of study and find application in every service of the hospital; it also describes certain courses used in building it up. The second part attempts to show the placement of the social elements as they appear and reappear throughout the curriculum in the above mentioned school. . . . This plan is presented, not as a model in any sense," but merely as a way one school has fused these elements in the curriculum.

Miss Frost's book will be warmly welcomed as the first publication to set forth in detail both the meaning of such instruction and a method for giving it, and the author has done an admirable job. She has written clearly, simply, and often graphically, and has given substance to what was before vague and shapeless. Many reports of student observations in ward, clinic, and home do much to present the patient as a human being influenced by his family relationships and his way of life and responding in his own way to doctors and nurses and to the hospital and clinic atmosphere. No one who reads this book can fail to garner a deeper insight into the purpose and true inwardness of nursing in sickness and in health, and a host of practical ideas of how it may be taught.

This reviewer does not think this book is the last word on the subject. Rather, it is the first exploration of this new field to be published, and points the way for further experimentation and enrichment; particularly is this true on the emotional side.

One feels perhaps a little more stress on man in the aggregate—man as an impersonal member of a community—than on the patient as a unique and original human being having his own peculiar emotional reactions to his

physical condition and the particular influences operating upon him. Not that these matters are overlooked but merely that their treatment might go deeper. One has a feeling, for instance, that the case studies are rather over-simplified. One could also wish that more light were thrown on the importance of the nurse's insight into fundamental factors underlying the patient's attitude and his family relationships as the basis for her selection of one out of several ways of working with him. Cultural and environmental factors are discussed, but the deeper sources of behavior lying in the personality are only hinted at and they are crucial to an understanding of the patient's attitude. Miss Frost often touches on points that might well be carried further in another book.

One delightful feature of the book is the presence and extraordinary choice of quotations with which Miss Frost heads her chapters.

In brief, Miss Frost has written an exceptionally helpful and timely book and all those who are interested in nursing education are her debtors.

ELIZABETH G. FOX

Nutrition and Physical Fitness—*By L. Jean Bogert, Ph.D. (3rd ed.). Philadelphia: Saunders,* 1939. 602 pp. Price, $3.00.

A large amount of new material has been incorporated in this edition, and at the time of completion the subject matter had been brought up to date. The treatment is adequate and authoritative. So far as possible the vocabulary is non-technical and the book can be read profitably by anyone who wishes to know something of nutrition and its relation to health, comfort, and efficiency.

The book covers a wide field and includes: the nature of foods, digestion, and metabolism; the specifications for adequate nutrition; current dietary fallacies; meal planning; and diets for special requirements. Earlier reviews should be consulted for a more detailed description of the table of contents. The chapter "Diseases in Which Diet Is of Major Importance" is omitted from this edition and a new chapter "Concerning Foods and Foodstuffs" has been added. A. G. HOGAN

Medical Climatology—*By Clarence A. Mills. Springfield, Ill.: Thomas,* 1939. 296 pp. Price, $4.50.

The author, Professor of Experimental Medicine at the University of Cincinnati, has for many years studied the relationship of climate and weather to disease. He has supplemented observations on human diseases with experiments on animals under controlled conditions of temperature and humidity. In this book he has collected the results of his studies for the purpose of bringing before the medical profession and other interested persons the importance of the climatic environment on physiological activity and pathological conditions. He emphasizes that many other factors enter into the picture, but these are minimized in order to stress the importance of climatic factors.

In the 18 chapters of the book he develops the thesis that human existence depends on the energy generated in the body and the ability of the body to utilize this energy efficiently. He shows the effect of depressing environmental heat and of changes in environmental temperature and humidity on the metabolic activity of man, and he develops the thesis that excessive climatic stimulation encourages the development of metabolic diseases such as diabetes, hyperthyroidism, and pernicious anemia, whereas the lack of such stimulation lowers the resistance of the body in overcoming infections such as tuberculosis, appendicitis, and leprosy. He believes that arteriosclerosis and circulatory failure are encouraged by the increased metabolism associated with

stimulating climate and that abnormal mental functions of the body, as illustrated by suicides, homocides and mental breakdowns, have a similar relationship to climate.

He deals with the problem of heat stroke and points out that the heat regulatory mechanism of the body requires slow adjustment to excessive external temperatures, thus accounting for a higher incidence of heat stroke in cooler temperate zones and in the early periods of hot weather. He indicates that dental caries has a direct relationship to cooler climates but suggests that other factors, such as hardness of drinking water, are also involved. He deals with rheumatic fever and rheumatic heart disease, pointing out the greater resistance in stimulating climates and the more rapid progress of the pathology where the climatic stress is greatest. He recommends that therapeutic use be made of the known facts in relation to climate and disease, employing warm dry areas, such as the southwestern states, for such diseases as rheumatic fever, tuberculosis, and other respiratory infections; temperate or highly stimulating regions for leprosy; and warm, soothing climates, such as the Gulf Coast, for metabolic and circulatory diseases and nervous breakdowns.

The subject of the conditioning of indoor environments is dealt with and the advantages of radiant heat in regulating indoor temperatures is emphasized. It is pointed out, however, that practical methods for accomplishing this are not yet developed.

The final chapters deal with tides in sickness and death rates in relation to climate. The author attempts to correlate recent periods of higher mean temperatures not only with lowered death rates but also with periods of financial depression. He believes that higher temperatures have decreased infections and metabolic strain but at the same time have lowered man's mental activity and caused a slump in financial conditions.

Finally, he relates these same principles to geological history and suggests that the world has reached a peak of climatic stimulation and is now entering a period of increased warmth and racial recession.

The book is plentifully supplied with maps and graphs illustrating the subject matter. The maps outline areas of greatest climatic stimulation or depression in relation to the subjects under discussion. One feels that the limited amount of data on which some of them are based detracts from their conclusiveness.

Although the reviewer believes that the accumulation of more information will probably show that climatic influences are not as important as this book would lead one to believe, the author has contributed greatly to a field which heretofore has received insufficient attention. The book is well printed and should be of interest to all students of the ecology of disease.

HENRY E. MELENEY

Annual Report of the Surgeon General of the Public Health Service of the United States—For the fiscal year 1939. *Washington: U. S. Government Printing Office,* 1939. 185 pp. Price, $.75.

This report which records the activities of the U. S. Public Health Service for its 141st year of existence is notable since it was the last year in which this Service functioned under the Treasury Department, having been transferred to the Federal Security Agency at the close of the fiscal year.[1]

The Surgeon General pays a deserved tribute to the Treasury Department and its secretaries, saying that the credit for the sound growth of the Service has been due largely to them. He records the evolution of the Service from a small organization devoted entirely to

the medical care of American merchant seaman to a "national health agency, broad in scope and manifold in functions which affect directly or indirectly the health of the people," and expresses regret at the termination of the relationships which it has enjoyed for 141 years under the Treasury Department.

The essential function of the Public Health Service is coöperation with state health authorities in specific health problems and the furtherance of sound programs for the public health. Through active assistance under title VI of the Social Security Act, the counties under the administration of a full-time medical health officer reached 1,371, while 1,500 individuals received public health training for official positions. A total of $44,861,322 in state and local funds exclusive of those of large cities was available in the jurisdiction under which federal funds were budgeted, an increase of $13,265,454 over 4 years ago. For venereal diseases the federal funds allotted to states amounted to $2,400,000, supplementing funds amounting to $4,300,000 from state and local sources. Facilities for treatment as well as education concerning the venereal diseases are increasing enormously, and it is believed that the states are now prepared to use economically the $5,000,000 authorized for venereal disease control work. For the fiscal year 1940, $4,379,250, or 86.9 per cent of the amount available, has been allotted.

Rocky Mountain spotted fever has been noted in several of the eastern states during the year and has now been reported in all but 7 states. Endemic typhus in the southern states has continued to spread, and in certain sections involves rural areas as well as cities. Weil's disease was recognized for the first time in New Jersey and Nevada. Dogs from Nevada, New York, and Pennsylvania suffered from the disease, and from rats in New York a virulent strain of the organism was isolated.

Naturally, cancer has occupied attention and the National Cancer Institute records progress. Grants-in-aid totalling $85,962.50 were recommended by the National Advisory Cancer Council and have been awarded to 13 institutions.

Health conditions generally improved in this country. No cases of cholera, yellow fever, or human plague were observed in 1938. Measles and smallpox were more prevalent than usual. In 1938 poliomyelitis showed a decline, but toward the close of the fiscal year there were epidemics in several states, and in the first half of 1939 the number of cases reported was 40 per cent higher than for the corresponding period of 1938.

Smallpox continues to be a blot on our record, 14,939 cases having been reported, or about twice the median for 1933–1937. There has been a steady increase since 1930, when about 5,000 cases were reported. The record for the United States is the worst of any country in the civilized world with the exception of India. Rocky Mountain spotted fever was reported from 32 states, 434 cases—an increase of 3 cases over the preceding year.

The provisional death rate for 1938 was 10.6, as compared to 11.2 for 1937, and 10.7 for 1933, the lowest general mortality rate recorded prior to 1938. Maternal mortality continued to decline for the 9th consecutive year.

For typhoid and paratyphoid fever, scarlet fever, diphtheria, poliomyelitis, epidemic cerebrospinal meningitis, tuberculosis, malaria, pellagra, diseases of the digestive system, nephritis, and diseases of pregnancy and childbirth, the rates were the lowest on record, while those for whooping cough, encephalitis, cerebral hemorrhage, diabetes, and diarrhea and enteritis among children under 2 years of age were about the same as in recent years. Cancer and heart disease were the only major causes of death showing higher rates. The

trend has been upward for both of these for several years, due in part to the greater number of people who reach the older ages when these diseases are more prevalent.

Cholera was found chiefly in India, China, and Indo-China, India reporting 356,373 cases, with 174,213 deaths, or more than twice the number reported for 1937. Plague was reported in India, Java, and Madura, Madagascar, Uganda, the Belgian Congo, Ceylon, Egypt, Kenya, and the Union of South Africa. Smallpox showed a decrease from 137,856 cases in 1937 to 124,269. Yellow fever was confined to a few small localities in Africa and South America. Extensive vaccination in the areas chiefly affected gave good results.

The Service receives current information on world prevalence of disease through the consulates, the Pan American Sanitary Bureau, the International Health Office in Paris, the Health Section of the League of Nations, foreign health services, and other organizations.

It is impossible to give details of this most interesting report as much of it is in summary. It should be read to be appreciated. MAZŸCK P. RAVENEL

REFERENCE

1. *A.J.P.H.*, Sept., 1939, p. 1044.

Death of a Yale Man — *By Malcolm Ross. New York: Farrar & Rinehart,* 1939. 400 pp. Price, $2.50.

This is not, as the title might indicate, a contribution in the field of vital statistics. The "death" described is merely the demise of the social attitudes characteristic of "good old Yale" twenty years ago. Malcolm Ross, after beginning a conventional career as a bond salesman was led by an instinct of adventure to roughing it in the oil fields and the coal mines, and then, by way of newspaper work reached an important post in the National Labor Relations Board. This book tells with extraordinary vigor and picturesqueness the tale of his experiences and of the broadening vision of human need and of the fundamental social problems involved in the relation between labor and capitalism. It is an absorbing story, recommended particularly to public health workers since our profession is—or should be—vitally concerned with the pressing social problems of the day in which public health plays so large a part.

C.-E. A. WINSLOW

Manual for Board Members—*Edited by Ella Geib Greene and Florence LaGanke Harris. Cleveland: Cleveland Child Health Association,* 1939. 42 pp., mimeographed.

This manual was prepared primarily for the members of the Board of Trustees of the Cleveland Child Health Association to give them, in the words of the President, "a comprehensive picture of the present program of the association and the manner in which it is administered through the activities of the Board of Trustees and the Staff." However, it should be of interest and service to others who are instituting or conducting similar activities in other communities.

The Cleveland Child Health Association is 10 years old and has made steady and unusual progress, in spite of the lean years due to the economic depression. Being a welfare agency dependent upon the Welfare Federation for the bulk of its budget, its finances have suffered due to the state of the federation funds. Nevertheless, with a wise and far-seeing director at its helm, it has been able to eliminate nonessentials and to develop those things which are most important in promoting the welfare of the children of a large city.

The *Manual* describes and gives a summary of the activities of the various committees of the organization, these reports being given in chronological

order following the chronological age of the child.

The association rightly puts great emphasis on its prenatal program. Its classes of private physicians as well as of clinics, for expectant mothers, under the direction of Mrs. Ellen D. Nicely, have grown and developed until they reach 5,000 expectant mothers a year—about one-third of those confined in Cleveland. Cleveland is leading in this program and has set an example for other cities to follow. The Cleveland Child Health Association was also a pioneer in establishing classes for "Expectant Fathers" in 1933.

The *Manual* as a whole is well written and any public health or welfare minded individual will find it interesting and informative reading.

E. V. THIEHOFF

Biological Products—*By Louis Gershenfeld. New York: Romaine Pierson Publishers,* 1939. 236 pp. Price, $4.00.

It would be axiomatic to imply that the intelligent therapeutic and prophylactic use of biologicals is predicated on a knowledge of at least the rudimentary principles of manufacture. This book is intended to supply students of medicine and of pharmacy with this information. The author has done a nice piece of work with a very complex subject. All of the important commercial biologicals are mentioned together with at least an outline of the method of manufacture and with detailed methods of standardization for those products that can be definitely standardized. Most of this latter material is taken from regulations of the U. S. Public Health Service. Although these are available on application, it is more convenient for the student to find them gathered under one cover.

The method for manufacture of antityphoid vaccine is that used by the Army Medical School and is presented in detail. Since the author has prepared such a comprehensive discussion, it would be superfluous to mention the various biologicals included. References to the literature are numerous and rather complete. The omission of the work of Kendrick and her associates on Pertussis Vaccine should be noted.

The book should be welcomed by teachers as well as by students.

JOHN F. NORTON

Butter—*By C. C. Totman, G. L. McKay, and C. Larsen (4th ed). New York: Wiley,* 1939. 472 pp., ill. Price, $3.50.

This book is a revision of *Principles and Practice of Buttermaking,* by the late G. L. McKay and C. Larsen. It departs from the earlier editions in that the buying and grading of cream and the coöperative market of butter are presented in considerable detail. As is explained in the preface, this book does not attempt to treat exhaustively the various topics presented and is apparently designed as a textbook for undergraduate instruction, dairy plant operators, and others interested in vocational training. Considerable material is presented in graphic form to facilitate instruction. The public health aspect of butter and buttermaking are not discussed.

M. E. PARKER

Stedman's Practical Medical Dictionary—*By Thomas Lathrop Stedman, M.D., and Stanley Thomas Garber, M.D. (14th ed.). Baltimore: Williams & Wilkins,* 1939. 1303 pp. Price, $7.00; $7.50 with thumb index.

When a dictionary has gone through 13 editions, successfully withstood the gamut of criticism, and established itself as an authoritative reference, it would usually be enough simply to announce the appearance of a new edition with a few comments as to enlargement, revision, being up-to-date, etc.

The present edition of Stedman requires a somewhat further notice, since the originator of this dictionary and its sole author from the first edition, died in 1938, at the age of 84. The 14th edition has been edited by his nephew, Dr. Garber, who collaborated in preparing this revision and who, at the request of Dr. Stedman, assumed the editorship of this and future editions.

A page from the preface to the 11th edition is included, which gives something of the history of Stedman's Dictionary. Medical writing apparently depreciated in quality both as to spelling and expression prior to 1908. At that time it had gotten so bad that Dr. Stedman felt the time had come "to stem the progress of medical cacography," so in that year the preparation of the first edition was begun and it appeared 3 years later.

There is no man in the medical profession to whom we are more indebted for the purification of medical orthography than Dr. Stedman. For 50 years through his editorials, writings, and translations, and for the past 28 years through his *Practical Medical Dictionary*, he fought consistently for correctness of terminology as well as of medical language in general.

The present edition shows careful revision and consideration of the multitude of new terms which have appeared. In scarcely any science have there been such rapid advances as in medicine and each one apparently brings with it a number of new terms more or less descriptive of the new findings. We need mention only the vitamins, the virus diseases, and immunity, to illustrate this point.

The make-up and printing of the book are excellent and it is not overburdened with illustrations. Opposite the title page is the Oath of Hippocrates handsomely printed with colored borders.

This dictionary can be recommended without reservation not only for those who are trying to improve their medical vocabulary, but also for editors, publishers, proof readers, abstracters, and all who have to do with medical literature.

MAZŸCK P. RAVENEL

Corrective Physical Education—*By Josephine Langworthy Rathbone, Ph.D. (2nd ed.). Philadelphia: Saunders,* 1939. 305 pp. Price, $2.50.

The new edition of this practical textbook has been thoroughly revised and brought up to date in modern methods of corrective physical education. A groundwork is laid in the essentials of anatomy, physiology and psychology. Especial attention has been given to the correction of psychophysical defects and a timely chapter on fatigue and relaxation has been added.

The simple line drawings and diagrams in the chapter on Reconstructive or Corrective Physical Education are unique and especially helpful in giving the student specific directions as to what type of exercise to prescribe. Chapters on Physical Recreation for the Handicapped and The School Problem complete the body of the text. A good glossary and a working bibliography add to the value as a modern textbook.

RICHARD A. BOLT

The Care and Handling of Milk—*By Harold E. Ross (2nd ed.). New York: Orange-Judd,* 1939. 417 pp. Price, $4.00.

The author states that in rewriting this book he has retained the same ideals as were in mind when the first edition was prepared, namely, to furnish as far as possible the latest information concerning the science and practice involved in the care and handling of milk. The book is intended as a text for dairy students and a guide for all who are interested in the production of milk and in its use as a

food. The training and experience of the author make him well qualified to do this as those who are familiar with the first edition can verify.

The same chapter headings as in the old edition are retained. Every chapter has been revised and some have been entirely rewritten. New sections have been added to several chapters and many new illustrations introduced. The important problems involved in the production, transportation, processing, and distribution of the nation's milk supply are ably discussed.

The author has succeeded well in his endeavor to bring the information in the book up to date. It is well written, clear, and concise. It contains much valuable information and deserves a place in the libraries of all who are interested in dairying and all schools which train farmers and dairymen. It is sound and authentic. The make-up and printing are good.

EARL R. GARRISON

Milk and Nutrition—*New Experiments Reported to the Milk Nutrition Committee. Part IV, The Effects of Dietary Supplements of Pasteurised and Raw Milk on the Growth and Health of School Children (Final Report); Summary of All Researches Carried Out by the Committee and Practical Conclusions. Reading (England): National Institute of Research in Dairying,* 1939. 70 pp. Price, $.75.

The unique value of milk in the diet is confirmed once again by the experiments described in this British report. From observations on 6,097 school children in four feeding groups, it was found that those who received supplementary milk, whether pasteurized or raw, showed greater increments in height, weight, and chest circumference than those who did not get extra milk. The increases were greater in the groups receiving ⅔ pint than in those favored with only ⅓ pint, but there were no differences in the growth promoting effects of raw and pasteurized milk. The milk-fed youngsters also displayed greater muscular strength, although not in proportion to the amount of milk consumed. Numerous tables are included to show specific data on the participants in the study.

The practical conclusions from all the researches, which began in 1935, are that milk is of great value for growth and health, and that there are no differences between the nutritive values of raw and pasteurized milk of any practical importance for school children who receive milk as part of their ordinary diet.

JAMES A. TOBEY

Pediatrics and Pediatric Nursing—*By A. Graeme Mitchell, M.D., B. K. Rachford, Echo K. Upham, R.N., and Elgie M. Wallinger, R.N. Philadelphia: Saunders,* 1939. 575 pp., ill. Price, $3.00.

This is an excellent textbook for the undergraduate nurse. Its numerous, valuable tables, book lists, outlines, definitions, summaries, questions and problems, charts and cross-indexing make it a particularly valuable reference book of elementary material for the public health worker.

While the material is inadequate in most of the "units" for the graduate nurse or the student of public health, it presents "Pediatrics for Nurses" in a logical, well organized form and with the point of view that the nurse will be "not simply a technician but rather an intelligent partner of the physician," and she will "teach children and parents proper principles of health and care in illness."

With the increased interest of public health workers in offering guidance in the use of the medical facilities of the community, there is need for a better understanding of other medical problems than those of communicable dis-

ease, the causes of infant mortality, and those diseases upon which the public health program is usually focused. The 17 short chapters on "Diseases of the Several Body Systems" provide a very satisfactory review of children's diseases and many medical problems that the public health worker should at least know about. As disease prevention is recognized as a field to which the practising physician contributes through early diagnosis and medical care, it is important that the public health worker realize what field the medical practitioner must cover. This "unit" provides much evidence of how diseases and physical handicaps can be prevented through case finding in the early stages and through guidance in obtaining service. This broad scope of material should be particularly useful to the public health worker without medical training who wants some general knowledge of children's medical problems.

HAROLD H. MITCHELL

Handbook of Chemistry — *By Norbert Adolph Lange (3rd ed.). Sandusky, Ohio: Handbook Publishers,* 1939. 1543 pp. Price, $6.00.

This is the third edition of a reference volume covering a great variety of chemical and physical data useful for those engaged in laboratory work. It succeeds the editions which appeared in 1934 and 1937. Although dealing principally with data relating to physical and chemical analysis, there are as well many subjects of interest to biologists who deal with water, with milk and milk products, and to those in common with chemists and physicists who depend on mathematical tables. Even a list of the subjects covered would require several pages, and one who is not dealing routinely with the changes in our knowledge of chemistry and physics is deeply impressed with the comprehensiveness of this volume which is more like the World Almanac than any other current publication. This reviewer intends to keep a copy available for frequent editorial reference. REGINALD M. ATWATER

Accepted Foods and Their Nutritional Significance — *Chicago: American Medical Association,* 1939. 492 pp. Price, $2.00.

This volume contains descriptions of the products which were on the list of accepted foods on September 1, 1939, classified into several categories, and listed in their classes in alphabetical order. These products are those which have been submitted to the Council and found satisfactory on the basis of evidence supplied by the manufacturer or independently secured by the Council.

In addition to the above, the rules and regulations of the Council and general decisions concerning food composition and nutritional claims which may be used in advertising matter are discussed. There is also given the Council's opinion regarding many topics in the field of nutrition.

The Council recognizes that the material in this book is likely to be out of date by the time it is published, hence frequent revisions are necessary and plans are being made to revise the volume from time to time.

This outline, which embodies what the Committee claims for the book, is good as far as it goes, but does not do justice to the contents. For example, the article on Milk and Milk Products Other than Butter, requires more than 60 pages. This includes a list of manufacturers and distributors of accepted products. Indeed, while the book is intended largely to prevent frauds in food products and false advertisement, it is almost a textbook on nutrition, which can be recommended to all interested in this great subject.

MAZŸCK P. RAVENEL

BOOKS RECEIVED

GOOD HEALTH AND BAD MEDICINE. By Harold Aaron. New York: McBride, 1940. 328 pp. Price, $3.00.

REPORTS ON MEDICAL PROGRESS, 1939. As Published in the *New England Journal of Medicine*. Compiled and Edited by Robert N. Nye. Boston: Little Brown, 1940. 562 pp.

FOURTH SARANAC LABORATORY SYMPOSIUM ON SILICOSIS. Edited by B. E. Kuechle. Wausau, Wis.: Employers Mutual, 1939. 379 pp. Price, $3.00.

MODERN DIABETIC CARE, INCLUDING INSTRUCTIONS IN THE DIET AND THE USE OF THE OLD AND NEW INSULINS. By Herbert Pollack. New York: Harcourt, Brace, 1940. 216 pp. Price, $2.00.

NON-PROFIT HOSPITAL SERVICE PLANS. By C. Rufus Rorem. Chicago: Commission on Hospital Service (18 East Division Street), 1940. 130 pp. Price, $.50; 4–10 copies, $.25 each; 11 or more, $.15 each.

HEIL HUNGER! HEALTH UNDER HITLER. By Dr. Martin Gumpert. New York: Alliance Book Corporation, 1940. 128 pp. Price, $1.75.

SOCIAL WORK ENGINEERING: AN OUTLINE OF TOPICS FOR SURVEY, PLANNING AND APPRAISAL. By June Purcell Guild and Arthur Alden Guild. New York: Harper, 1940. 136 pp. Price, $1.75.

FUNCTIONAL HUMAN ANATOMY. By Cleveland Pendleton Hickman. New York: Prentice-Hall, 1940. 501 pp. Price, $3.75.

QUANTITY FOOD SERVICE RECIPES. Compiled by Administration Section of the American Dietetic Association. Philadelphia: Lippincott, 1940. 436 pp. Price, $4.00.

BIBLIOGRAPHY OF SWIMMING. Compiled by Frances A. Greenwood. New York: Wilson Co., 1940. 308 pp. Price, $4.25.

INTRODUCTION TO HOUSING: FACTS AND PRINCIPLES. By Edith Elmer Wood. Washington: Government Printing Office, 1940. 161 pp. Price, $.30.

THE SOCIAL FUNCTION OF SCIENCE. By J. D. Bernal. New York: Macmillan, 1939. 482 pp. Price, $3.50.

CIVIL SERVICE IN PUBLIC WELFARE. By Alice Campbell Klein. New York: Russell Sage, 1940. 444 pp. Price, $2.25.

EDUCATION OF THE HANDICAPPED. Volume II: Problems. Edited by Merle E. Frampton and Hugh Grant Rowell. Yonkers: World Book Co., 1940. 440 pp. Price, $2.80.

THE GIRL TODAY—THE WOMAN TOMORROW. Lucretia P. Hunter. Rev. ed. New York: Allyn & Bacon, 1939. 374 pp. Price, $1.20.

MIGRATION AND SOCIAL WELFARE. By Philip E. Ryan. New York: Russell Sage, 1940. 114 pp. Price, $.50.

FAITHS THAT HEALED. By Ralph H. Major. New York: Appleton-Century, 1940. 290 pp. Price, $3.00.

THE REORGANIZATION OF PUBLIC ASSISTANCE. Report 1938–1939. Department of Welfare, City of New York, 1940. 193 pp.

MAKING THE MOST OF MATURITY. Life Conservation Service of the John Hancock Mutual Life Insurance Co., Boston, Mass., 1940. 31 pp.

EXERCISE AND KEEP FIT. By Terry Hunt. New York: Prentice-Hall, 1940. 202 pp. Price, $1.96.

FETAL AND NEONATAL DEATH: A Survey of the Incidence, Etiology, and Anatomic Manifestations of the Conditions Producing Death of the Fetus in Utero and the Infant in the Early Days of Life. By Edith L. Potter and Fred L. Adair. Chicago: University of Chicago Press, 1940. 207 pp. Price, $1.50.

STAGE FRIGHT AND WHAT TO DO ABOUT IT. By Dwight Everett Watkins and Harrison M. Karr. Boston: Expression Company, 1940. 110 pp. Price, $1.50.

EATING YOUR WAY TO HEALTH. Published and Prepared by The Central Nutrition Committee, Department of Public Instruction, Honolulu, T. H., 1939. 31 pp.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

An Annotation for You to Complete—Although the diets of 80 normal adolescent girls were generally poor, being deficient in vegetables, fruit, milk, and whole cereals, about half had optimum weight. No statistical relationship between diet and caries could be established, probably because none of the diets were good enough to have a protective influence.

BAYER, L. M. The Diet of Adolescent Girls. J. Pediat. 16, 1:56 (Jan.), 1940.

Horse Encephalitis—Vaccination of volunteers with chick embryo culture vaccines of equine encephalitis suggests the safety and value of this prophylactic procedure.

BEARD, J. W., *et al.* Vaccination of Man against the Virus of Equine Encephalomyelitis (Eastern and Western Strains). J. Immunol. 38, 2:117 (Feb.), 1940.

Practical Public Dental Hygiene—Assuming that you agree with him that dental defects are the most common of all physical defects in children, that the corrective program is far behind the incidence rate, and that dental disease is detrimental to health, the author asks you to follow him through the list of workers who might possibly undertake a dental health educational service. You'll have to read this excellent paper to get the answer.

CHOPE, H. D. An Administrator Cogitates His Dental Health Program. J. School Health. 10, 2:31 (Feb.), 1940.

More about Intradermal Vaccination—Another report on intradermal vaccination with culture virus suggests that it is not quite as effective as the ordinary cutaneous method using calf lymph virus. Although mild reactions were the rule, some marked cutaneous reactions occurred.

DONNALLY, H. H., *et al.* Smallpox Vaccination of Newborn Infants with Culture Virus and with Calf Lymph Virus. Am. J. Dis. Child. 59, 2:322 (Feb.), 1940.

For Gullible Venereal Patients—An investigator visited all sorts of drug stores the country over, telling about a friend who had symptoms presumably of both gonorrhea and syphilis: only 7 per cent of the druggists refused to sell venereal remedies, 62 per cent offered to diagnose and treat the case, whereas 31 per cent were not willing to make a diagnosis but would sell nostrums. This record is much worse than that of a similar study made 6 years previously. Quackery too is rampant.

EDWARDS, M. S., and KINSIE, P. M. Illegal and Unethical Practices in the Diagnosis and Treatment of Gonorrhea and Syphilis. Ven. Dis. Inform. 21, 1:1 (Jan.), 1940.

Cold Checks Embryonic Growth—This is the clearest and most informative article that we have seen on the treatment of cancer by refrigeration.

FAY, T. Human Refrigeration. Quart. Rev. (New York City Cancer Comm.). 4, 4:68 (Jan.), 1940.

Just the Usual Routine—The 75 different activities that local health departments should be carrying on makes an imposing list of responsibilities.

FOOTE, F. M. Your Town: Certain Responsibilities of Health Officers. Month. Health Bull. (Connecticut). 54, 1:3 (Jan.), 1940.

A British Health Problem—We are not alone in our troubles with our social problems. In England a plan was devised for selling milk to necessitous families at a reduced price. One gathers from the health officer's article criticising the scheme, that it won't please the health officials or the milk distributors, and that it is an underhanded method of unloading surplus milk. They should try our colored stamp scheme.

GALLOWAY, J. F. The Reduced-Price Milk Scheme Examined and Criticized. Pub. Health. 53, 5:105 (Feb.), 1940.

The Why of Exhibits—No educational method is a cure-all, but the exhibit reaches many who do not care, who seldom listen to the radio health talk, read a pamphlet, attend lectures, or see a doctor if they can help it, concludes this discussion of the cancer exhibit at the New York World Fair.

GEBHARD, B. Mass Education by Health Exhibits. Quart. Rev. (N. Y. City Cancer Comm.). 4, 4:80 (Jan.), 1940.

Vaccination Prevents Smallpox—It seems that smallpox has been wiped out in Montreal by vaccination.

GROULX, A. Elimination of Smallpox in Montreal by Vaccination. Canad. Pub. Health J. 31, 1:6 (Jan.), 1940.

Children's Diseases—Disabling illnesses that kept children home for at least 7 days were more frequent among children under 10 than over that age; 4 out of 5 illnesses were acute communicable or respiratory diseases—against which something might be done. Orthopedic impairments were largely congenital defects, accidental injury and poliomyelitis.

HOLLAND, D. F. The Disabling Diseases of Childhood. Pub. Health Rep. 55, 4:135 (Jan. 26), 1940.

Kinds of Medical Care for a Half Million Children—You may have anticipated these findings but the nation-wide survey reveals that children in families of high income level, received more intensive care when sick outside the hospitals than did those of low income families. There are other findings that you may not have anticipated, so the paper should be studied in its entirety.

HOLLAND, D. F. The Disabling Diseases of Childhood. Pub. Health Rep. 55, 6:227 (Feb. 9), 1940.

Dollars and Dental Caries—One reason for annotating this paper is to use the word "odontothanatotic"; the other is to report its conclusions which are: the tendency of children to dental caries attack is not directly related to the economic status of the community, but the volume of dental care received is. The odontothanatotic rate diminishes as the economic level rises. Now, you see, you'll have to read the paper.

KLEIN, H., and PALMER, C. E. Community Economic Status and the Dental Problem of School Children. Pub. Health Rep. 55, 5:187 (Feb. 2), 1940.

Old People, Too, Are Humans—Here is a milestone: a symposium on senescence. Explorations in this largely untilled field are made by a dozen competent pioneers.

LAWTON, G., *et al.* Old Age and Ageing. (6 papers.) Am. J. Orthopsychiatry. 10, 1:27 (Jan.), 1940.

On Original Sin—British views on the subjects of problem parents, difficult children, and awkward families, all are applicable on this side of the ocean. The conclusion seems to be that difficult personalities, like crooked noses, run in families.

MACCALMAN, D. R., *et al.* Discussion of Family Discords. J. Roy. San. Inst. 60, 8:301 (Feb.), 1940.

Latest News about Vitamins—Knowledge of vitamins grows at such a pace that an annual review of the progress becomes necessary. If read with an eye on the preceding statements, the current review provides all the ordinary health worker needs to know on this important subject.

MEIKLEJOHN, A. P. The Vitamins. New Eng. J. Med. 222, 8:313 (Feb. 22), 1940.

Nose - Holding Department — Though no new or radical changes in sewage treatment methods appeared in 1939, the established processes were made more dependable: it was a year of real progress, giving rise to hopes for continuing improvement—so says this competent reporter.

RUDOLFS, W. Developments in Sewage and Waste Treatments During 1939. Munic. San. 2, 2:57 (Feb.), 1940.

Children's Needs in a New Decade—This fourth in a series of decennial national conferences on child life was outstanding in many ways including the attendance of 672 important people, the scope of its coverage, the breadth and depth of its findings. The whole issue of this magazine is devoted to the subject.

SPRINGER, G., and CLOSE, K. Children in a Democracy (and 4 related papers). Survey Midmonthly. 76, 2:37 (Feb.), 1940.

Colds May Be Something Else—Observations made upon several classes of small children have revealed so many youngsters with signs of upper-respiratory infection toward the end of the incubation period following exposure to such communicable diseases as scarlet fever, measles, and chicken pox, that one may assume that the etiologic agents of these diseases may manifest themselves as ordinary colds more frequently than we think.

TURNER, N. C. Common Colds. New Eng. J. Med. 222, 5:184 (Feb. 1), 1940.

Population vs. Pollution—Modern pollution preventive practices aim to fit the treatment method to the stream. A balanced viewpoint is ably presented here.

WOLMAN, A. Pollution Control—Where Does It Stand? Munic. San. 2, 2:64 (Feb.), 1940.

ASSOCIATION NEWS

SIXTY-NINTH ANNUAL MEETING
DETROIT, MICH., OCTOBER 8–11, 1940

HEADQUARTERS
Book-Cadillac Hotel and Hotel Statler

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

Robert N. Barr, M.D., C.P.H., 1912 E. River Terrace, Minneapolis, Minn., Director of Local Health Service, State Dept. of Health

Carl E. Barstow, M.D., 754 Massachusetts Ave., Arlington, Mass., Member, Board of Health

Stanley R. Benner, M.D., 27 N. Front St., Yakima, Wash., Health Officer, City-County Health Dept.

Thomas J. Bergin, M.D., Town Hall, Greenwich Ave., Greenwich, Conn., Health Officer

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H. C. Blankmeyer, M.D., Health Dept., City Hall, Springfield, Ill., Director

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Edgar J. Easley, M.D., Miller County Health Unit, Texarkana, Ark., Director

Gregory L. Endres, M.D., Fort Defiance, Ariz., Associate Medical Officer, U. S. Indian Service

Lawrence W. Fitzmaurice, M.D., F.A.C.S., Nassau, Bahamas, B. W. I., Medical Officer and Bacteriologist

Wilson P. Hamilton, M.D., M.P.H., Health Dept., Logan, W. Va., Logan County Health Officer

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Harry J. Warner, M.D., 404 Federal Bldg., Spokane, Wash., Medical Director, U. S. Indian Service

DECEASED MEMBER

George W. Hemmeter, M.D., Baltimore, Md., Elected Member 1936

INDUSTRIAL HYGIENE REPORTS AVAILABLE

THROUGH the courtesy of the Division of Industrial Hygiene, U. S. Public Health Service, Washington, D. C., copies of 4 reports, prepared under the auspices of the Section on Industrial Hygiene by Henry F. Smyth, M.D., Dr.P.H., have been made available. Two of these reports relate to industrial anthrax, one to volatile solvents and the other to skin irritants.

STANDARD METHODS FOR THE EXAMINATION OF WATER AND SEWAGE

THIS volume, now in its Eighth Edition, is a joint publication between the American Water Works Association and the American Public Health Association. The Joint Editorial Committee between the two organizations is being reorganized, looking toward the production of the Ninth Edition. The three A.P.H.A. representatives on the Joint Committee have been appointed by the Committee on Research and Standards and this list is now made up of W. L. Mallmann, Ph.D., Michigan State College, A. M. Buswell, Ph.D., University of Illinois, and John F. Norton, Ph.D., Kalamazoo, Mich. The A.W.W.A. representatives are Messrs. Hatfield, Leverin and Schwartz. A preliminary organization meeting of this group will be held in May in Chicago.

VOLATILE SOLVENTS

THE Publication Office of the American Public Health Association regrets two errors occurring in the 1939–1940 Year Book, in connection with the Committee on Volatile Solvents. The personnel as given on page 32 is incorrect. It should be as follows:

Henry F. Smyth, Jr., Ph.D., *Chairman*
W. P. Yant
Dr. Don D. Irish
Warren Cook
Henry Field Smyth, M.D.

Further, the credit for mimeographing is erroneously given. This report has been made available through the courtesy of Dr. Henry F. Smyth, Jr., and the mimeographing was done at the Mellon Institute of Industrial Research.

EMPLOYMENT SERVICE

The Employment Service will register persons qualified in the public health field without charge. Replies to these advertisements, when keyed, should be addressed to the American Public Health Association, 50 West 50th Street, New York, N. Y., identifying clearly the key number on the envelope.

POSITIONS AVAILABLE

WANTED—A city health officer for city of 32,000 population. Applicant must have a year of postgraduate training in public health and some administrative experience in public health as city, county, or district health officer. U. S. citizenship required. **W450**

Young, energetic, well trained public health nurses needed in Montana for rural areas. Salary $135 per month, plus travel. Write Supervisor of Public Health Nursing, Montana State Board of Health, Helena, Mont.

POSITIONS WANTED

Physician, M.D., McGill; C.P.H., Johns Hopkins; excellent background of communicable disease control and school health service, seeks position as epidemiologist or public health administrator. **A368**

Well qualified woman physician, M.A. and M.D. from Stanford, with 6 years' experience in nationally known secondary school in health education and medical advisory duties, wishes position in college health work. **H448**

Young man, bacteriologist, especially trained in viruses and rickettsial and all phases of public health laboratory work; Sc.D., Johns Hopkins; now assistant state laboratory director; qualified to consider teaching, executive, administrative, or research position; particularly interested in and qualified for practical laboratory methods with viruses. **L451**

Woman statistician, experienced in supervision, statistical analysis, etc., will consider change of position. Year's course in public health and vital statistics at Harvard. Serving now as statistical supervisor. **S452**

Advertisement

Opportunities Available

CITY HEALTH OFFICER—Western town of 25,000; young physician qualified to carry on established health program; staff of 14; vicinity $5,000, plus car and car expenses. PH-40, Medical Bureau, Palmolive Building, Chicago.

COUNTY HEALTH PHYSICIAN — Young southerner trained in public health problems; must be under 35; rural location; $225. PH-41, Medical Bureau, Palmolive Building, Chicago.

STUDENT HEALTH PHYSICIAN—Physician, under 45, with teaching experience preferred; large university; $2,500–$3,000. PH-42, Medical Bureau, Palmolive Building, Chicago.

ASSISTANT DIRECTOR — Municipal public health laboratories; duties include examination and diagnosis about 2,000 surgical specimens annually and performance of autopsies; 2 years' training pathology and bacteriology required; vicinity $4,000; East. PH-44, Medical Bureau, Palmolive Building, Chicago.

PUBLIC HEALTH SUPERVISOR — Graduate nurse with college degree, degree in public health nursing, and supervising experience in standard public health agency; $160, increasing to $175, plus car allowance; large southern metropolis. PH-45, Medical Bureau, Palmolive Building, Chicago.

PUBLIC HEALTH NURSE—In addition to degree and public health supervising experience should be specially trained in venereal diseases; public health certificate required; $250. PH-46, Medical Bureau, Palmolive Building, Chicago.

PUBLIC HEALTH NURSE—Well organized county health unit; $125 plus car allowance; Michigan. PH-47, Medical Bureau, Palmolive Building, Chicago.

PUBLIC HEALTH NURSE—South central city of 75,000 having public health nursing staff of 5; must have public health certificate; $125, car allowance. PH-48, Medical Bureau, Palmolive Building, Chicago.

NURSING SUPERVISOR—Public health nursing association established 20 years; duties begin around September 1; New England city. PH-49, Medical Bureau, Palmolive Building, Chicago.

Situations Wanted

PUBLIC HEALTH NURSE—Graduate of fairly large training school; B.S. in nursing, University of Washington; certified public health nurse; 8 years, city and county health work; 2 years, director of nurses, child welfare organization; most recent appointment, consultant nurse in midwestern state department of health; for further information, please write Burneice Larson, Director, Medical Bureau, Palmolive Building, Chicago.

WELL TRAINED YOUNG MAN—Available for public health appointment; Bachelor's degree state college; graduate training in education and sociology; M.S. in public health, University of Michigan; has completed required work, except thesis, for doctorate; several years' successful teaching experience before entering public health field; 6 years' important executive experience; for further information please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

PUBLIC HEALTH PHYSICIAN — B.S. and M.D. degrees, eastern schools; C.P.H., Johns Hopkins; 5 years' chief epidemiologist State Department of Health; for further information please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

BACTERIOLOGIST AND IMMUNOLOGIST—10 years' teaching and research in immunology, leading university; B.S. and Ph.D. degrees; memberships: American Assn. Pathologists and Bacteriologists, American Association of Immunologists; for further details please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

NEWS FROM THE FIELD

SENATE HEARING ON PRESIDENT'S HOSPITAL BILL

A SUB-COMMITTEE of the Senate Committee on Education and Labor, of which Senator Murray of Montana is Chairman, held hearings in Washington on March 18–19 on the Bill (S. 3230) introduced by Senators Wagner of New York and George of Georgia, appropriating 10 million dollars for the building at federal expense of some 50 small hospitals throughout the most economically depressed areas of the country (see *A.J.P.H.*, March, 1940, p. 312).

Among other organizations, the American Public Health Association was represented through its committee authorized to confer with federal agencies, by Reginald M. Atwater, M.D., Executive Secretary, who appeared at the hearing on April 19. The testimony on behalf of the Association is summarized as follows:

1. The American Public Health Association records its satisfaction in this Bill as reflecting a continuing interest of the federal government in the health of the nation.

2. There are large areas in many of our states which do not enjoy the benefits of adequate health service and in which there is a notable lack of hospital facilities. The Association has approved the expansion of public health services, including necessary medical, hospital and nursing care, to families unable to obtain adequate care through their own resources.

3. All appraisals of national health resources reveal the existence of many communities in which hospital facilities are meager or lacking. The inadequacy of institutional facilities presents a handicap to the control of tuberculosis, mental disease, and many other important conditions, and those requiring care in hospitals are deprived of the full benefits of modern medical treatment. A concept of the close interrelationship between preventive and curative medicine, we believe, is basic to the public health program. We wish to be recorded as opposed to any plan which regards treatment and cure as belonging in watertight compartments.

4. The Association has endorsed in general the plans for federal aid to the states for the construction of additional hospital facilities and hospital care as needed.

5. We believe that it is essential that any program to be worthy of federal aid should include adequate provisions for the maintenance of high personnel standards and that the benefit from federal aid to such local agencies should be withheld when it is found that substandard services are being furnished.

6. Specifically with regard to S. 3230, we find that the provisions of the Bill afford a desirable latitude to the states and localities in defining the population to be served by such hospitals.

We approve the Bill in principle as it provides for a National Advisory Hospital Council under the Chairmanship of the Surgeon General of the Public Health Service and for a review by the Council of applications for aid under the Act.

We also approve the authority to formulate standards for proper conduct of the hospitals and for maintenance of high professional levels of service.

We regard as especially important the provision for the training and instruction of personnel.

The Association approves a liberal definition of the term "hospital" as contained in the Act because there is a variety of structures like dispensaries or health centers, laboratories, x-ray units, etc., which will best serve some of the rural communities and the economically depressed areas.

It would appear to the representatives of the American Public Health Association that the proposal advocated by S. 3230 is a step in the right direction, but clearly not an adequate answer to the need of the country for a national health program or an answer to the need of local areas for adequate health services. We shall not be content to substitute this hospital bill for other essential elements in a national health program, nor would we be willing to see the purpose of this act carried out at the expense of basic public health services which are now only poorly financed.

OLD AGE SECURITY FOR EMPLOYEES OF NON-PROFIT ORGANIZATIONS

THE Federal Old Age Retirement Plan under the Social Security Act has recently become a reality with the payment of the first monthly checks to those persons 65 years of age who are included in the plan. However, all employees of social agencies, voluntary health groups, educational and other non-profit institutions have been reminded that they are ineligible for these benefits because of requests made when the plan was set up by representatives of their own groups. Fearing that the cost of employer contributions and the danger of losing tax exempt status might work a hardship on the organizations, many asked exemption when the original Social Security Act was before Congress.

Today, according to Alan T. Burns, Executive Vice-President of Community Chests and Councils, Incorporated, who is Secretary of a special committee on this subject, it looks different to many long-sighted organizations who see in federal retirement insurance the best and least expensive means of giving to their employees a measure of protection consistent with their own high social standards. This committee believes that the sooner such coverage for non-profit institutions is secured, the more the organizations and their employees will profit, since monthly benefit payments increase with each year the employee works before retirement.

An amendment to the Social Security Act will soon be proposed designed to eliminate the exemption of services performed in the employ of non-profit agencies from coverage under the Old Age and Survivors' insurance program. Legal authorities are agreed that the proposed amendment eliminates any apprehension lest these organizations lose their tax-exempt status, because of the provision that contributions from non-profit organizations and their employees will be deposited directly into the Old Age and Survivors' Insurance Trust Fund, rather than into the general Treasury for appropriations.

The amendment as proposed is sponsored by a representative group of agencies from the social work field, and a considerable number of health agencies have shown an interest because of an increasing desire of their staffs to be included. If the Act becomes operative in 1941 as expected, both employers and employees would pay 1 per cent annually on the first $3,000 of an employee's salary for the years 1941–42. The payments would increase to 2 per cent for the next three years, followed by three years at 2½ per cent, and thereafter payments of 3 per cent would be required by both employer and employee.

MARYLAND CONFERENCE

THE 20th Annual Health Conference of the Maryland State Department of Health field and departmental staffs will be held in Baltimore, and May 3 has been selected as the provisional date. Dr. Robert H. Riley, State Commissioner, will preside at this meeting when the pneumonia control program will be discussed.

Among the speakers will be Lloyd D. Felton, M.D., of the National Institute of Health, Washington, D. C., who will present a preliminary report on the preventive campaign carried on in Washington County, and Maurice C. Pincoffs, M.D., Chairman of the Pneumonia Control Committee of the Maryland State Board of Health, who will review the findings with regard to the use of sulfapyridine in the treatment of pneumonia.

INDIAN SERVICE TUBERCULOSIS INSTITUTE

AN Indian Service Tuberculosis Institute was held during February at the Navajo Medical Center, Fort

Defiance, Ariz., under the direction of Dr. Esmond R. Long and Margaret Smith of the Henry Phipps Institute, Philadelphia.

Other participants in the program were representatives of the U. S. Public Health Service loaned to the Indian Service medical staff, including Dr. Estella F. Warner, of Albuquerque, N. M., Dr. L. B. Snavely, of San Francisco, Calif., Dr. B. Sedlacek, of Fort Defiance, Ariz., Dr. W. G. Lewis, of Winslow, Ariz., and Dr. Archie Sheinmel, of the U. S. Indian Service.

The attendance included 121 persons from the eleven Indian agencies in the Southwest.

GOVERNMENTAL INDUSTRIAL HYGIENISTS

IN connection with the Third Annual Conference of Governmental Industrial Hygienists, J. J. Bloomfield, as Secretary-Treasurer of the Conference, has announced that the program to be held in Washington, D. C., April 30–May 2, will convene in Wilson Hall of the Administration Building of the National Institute of Health, Bethesda, Md.

The program is planned to cover topics relating to industrial hygiene of interest both to the federal and state administrators. A symposium on Interdepartmental Relationships between State Industrial Commissions, State Departments of Health, the Medical Profession and official industrial hygiene services will be a feature of the program, which will also include many reports of conference committees. Copies of the program may be obtained from Mr. Bloomfield at the Public Health Service in Washington.

DE KRUIF ARTICLES REPRINTED

THE Curtis Publishing Company, Philadelphia, has assembled in reprint form three articles by Paul de Kruif, which appeared in the October and December, 1939, issues and the January, 1940, issue of *The Country Gentleman* under the title "The People Demand Public Health." The titles of the articles are "Public Health Is Good for Doctors," "Public Health Needs the Doctors," and "The People Demand Public Health."

PERSONALS

Central States

HENRY H. ASHER, M.D.,† has been appointed as Health Officer of Sedgwick County, Kans., succeeding FLOYD C. BEELMAN, M.D.†

FLOYD C. BEELMAN, M.D.,† of Wichita, Kans., for 3 years Health Officer of Sedgwick County, has accepted the position of Director of the Division of Tuberculosis Control of the Kansas State Board of Health.

HAROLD S. DIEHL, M.D., Sc.D.,* Dean of the University of Minnesota Medical School, Minneapolis, Minn., has been appointed a member of the National Advisory Health Council of the U. S. Public Health Service.

DR. HALE F. SHIRLEY, Assistant Professor of Psychiatry, State University of Iowa College of Medicine, Iowa City, Ia., has been appointed Assistant Professor of Psychiatry and Pediatrics, and Director of the new Child Guidance Clinic at Stanford University School of Medicine, Stanford University, Calif.

Southern States

DR. WILLIAM M. ASKEW, JR., formerly of Auburn, Ala., has been named Health Officer of Butler County, succeeding DR. THOMAS C. ELLIOTT, of Greenville, resigned.

FRANKLIN A. CLARK, of the U. S. Public Health Service, has been appointed Director of the Division of Inspection of the Alabama State Depart-

* Fellow A.P.H.A.
† Member A.P.H.A.

ment of Health, succeeding C. A. ABELE, CH.E.,* who left to become Director of the Division of Dairy Products of the Board of Health of Chicago, Ill.

J. MCIVER JACKSON, M.D., has been appointed Health Officer of Prince William Stafford County District, Va., succeeding DR. GARNETT SNEAD.

DR. THOMAS F. MCGOUGH has been appointed Assistant Health Officer of Pulaski County, Va.

DR. CLARK E. PHILLIPS, of Orange, Tex., has been appointed Health Officer of Orange County, to succeed the late DR. JEFFERSON D. YATES.

DR. ROY J. SETTLE, formerly of Inman, S. C., has been elected Health Officer of Clarke County Ala., succeeding BENJAMIN S. BLACK, M.D.,† who resigned to enter private practice in Chicago.

DR. CECIL G. YARBROUGH, JR., of Midland, Tex., has been appointed Health Officer of a new Midland city and county health unit.

Western States

DR. FREDERICK T. BURKE, of Timber, Ore., has been appointed Health Officer of Washington County, succeeding RICHARD N. SHERWIN, M.D.,† of Hillsboro, who resigned.

JOHN J. SIPPY, M.D.,* District Health Officer of the San Joaquin Local Health District, Stockton, Calif., has announced that grants have been made by the International Health Division of the Rockefeller Foundation and the California State Department of Public Health to support an epidemiological and statistical study of syphilis in the San Joaquin Local Health District unit under the directorship of ROBERT DYAR, M.D.† According to Dr. Sippy, it is expected that the study will last from three to five years and will include the analysis of syphilis prevalence and the efficacy of control methods and treatment methods. In addition to the cooperation of the entire staff, Dr. Dyar will have the assistance of a public health nurse and a statistical clerk.

Canada

DR. GEORGE H. JOHNSON, of Vancouver, B. C., Can., has been appointed Health Officer of Clark County, Wash., to succeed JOHN A. KAHL, M.D.†

DEATHS

MELVILLE D. DICKINSON, M.D.,† formerly a District Health Officer on the staff of the New York State Department of Health, with jurisdiction over Nassau and Suffolk Counties, died January 30.

SVEN R. LOKRANTZ, M.D.,* Director of Health Service, Los Angeles, Calif. City Schools, died recently.

JAMES ROBERTS, M.D.,* Medical Officer of Health, Hamilton, Ont., Canada, died March 15.

* Fellow A.P.H.A.
† Member A.P.H.A.

CONFERENCES AND DATES

American Academy of Political and Social Science. Philadelphia, Pa. April 12–13.

American Association for Health, Physical Education, and Recreation (division of the National Education Association). Hotel Stevens, Chicago, Ill. April 24–26.

American Association for Social Security. New York, N. Y. April 12–13.

American Association of Public Health Dentists. Cleveland, Ohio. September 8–9.

American Association of Social Workers (Delegate Conference). Grand Rapids, Mich. May.

American Association of the History of Medicine. Atlantic City, N. J. May 4–5.

American College of Physicians—24th Annual Session. Cleveland, Ohio. April 1–5.

American Dental Association. Cleveland, Ohio. September 9–13.

American Dietetics Association — 23rd Annual Meeting. New York, N. Y. October 21–24.

American Heart Association. Scientific Meeting. Hotel Roosevelt, New York, N. Y. June 7–8.

American Home Economics Association —33rd Annual Meeting. Cleveland, Ohio. June 23–27.

American Hospital Association. Boston, Mass. September 16–20.

American Library Association. Cincinnati, Ohio. May 26–June 1.

American Medical Association — 91st Annual Meeting. Waldorf-Astoria Hotel, New York, N. Y. June 10–14.

American Pediatric Society. Skytop, Pa. May 2–4.

American Public Health Association —69th Annual Meeting. Book-Cadillac Hotel, Statler Hotel, Detroit, Mich. October 8–11.

American Red Cross—Annual Convention. Washington, D. C. April 1.

American Scientific Congress—8th. In connection with celebration of 50th Anniversary of founding of the Pan American Union. (First Section meeting, May 13.) Washington, D. C. May 10–18.

American Society of Biological Chemists. New Orleans, La. April 13–17.

American Society of Civil Engineers. Spring Meeting. Kansas City, Mo. April 17–19. Summer Meeting. Denver, Colo. July 24–26.

American Society of Planning Officials. National Conference on Planning, in coöperation with American Institute of Planners, American Planning and Civic Association, and National Economic and Social Planning Association. San Francisco, Calif. July 8–11.

American Water Works Association—60th Annual Meeting. Kansas City, Mo. April 21–25.

Indiana Section—Purdue University, West Lafayette, Ind. April 4–5.

Montana Section—New Milligan Hotel, Miles City, Mont. April 5–6.

Ohio Section — Mayflower Hotel, Akron, Ohio. May 9–10.

Pacific Northwest Section—Portland Hotel, Portland, Ore. May 9–11.

Florida Section — Seminole Hotel, Jacksonville, Fla. May 16–18.

Illinois Section—Congress Hotel, Chicago, Ill. May 22–24.

New York Section — Ithaca Hotel, Ithaca, N. Y. June 6–7.

Michigan Section — University of Michigan Union, Ann Arbor, Mich. September 11–13.

Rocky Mountain Section—Denver, Colo. September 16–17.

Western Pennsylvania Section — Castleton Hotel, New Castle, Pa. September 18–20.

Southwest Section — Mayo Hotel, Tulsa, Okla. October 14–17.

New Jersey Section—Atlantic City, N. J. October 18–19.

Kentucky-Tennessee Section — Lafayette Hotel, Lexington, Ky. October 21–23.

California Section—Los Angeles Biltmore Hotel, Los Angeles, Calif. October 23–26.

Minnesota Section—St. Paul Hotel, St. Paul, Minn. November 7–8.

Arizona Public Health Association. Tucson, Ariz. April 16–17.

Association of American Medical Colleges. Ann Arbor, Mich. October 28–30.

Association of American Physicians. Atlantic City, N. J. May 7–8.

Building Officials Conference of America. St. Louis, Mo. June 3–6.

Central Atlantic States Association of Dairy, Food and Drug Officials—Annual Conference. Hotel Raleigh, Washington, D. C. May 16–17.

Citizens' Conference on Government Management. University of Denver. Estes Park, Colo. June 17–22.

Civil Service Assembly. Central Regional Conference, Chicago, Ill., May 15–17. Western Regional Conference, Portland, Ore., June 24–26. Eastern Regional Conference, June.

Conference of State and Provincial Health Authorities of North America. Washington, D. C. May 7–8. (May 11, at National Institute of Health.)

Conference on Educational Policies—Eighth. Teachers College, Columbia University, New York, N. Y. April 4.

Convention for the Revision of the Pharmacopoeia of the United States. Washington, D. C. May 14.

Dairy Industries Supply Association. Atlantic City, N. J. October 21–26.

Florida Public Health Association. Tampa, Fla. December.

Governmental Industrial Hygienists—Annual Conference. Wilson Hall, Administration Building of the National Institute of Health, Bethesda, Md. April 30, May 1–2.

Greater New York Safety Convention—11th Annual. Pennsylvania Hotel, New York, N. Y. April 16–18.

Health Officers and Public Health Nurses—Annual Conference. Under the Auspices of the New York State Department of Health. Saratoga Springs, N. Y. June 24–27.

Indiana State Medical Association. French Lick Springs Hotel, French Lick, Ind. October 29–31.

Institute of Food Technologists—First Meeting. Morrison Hotel, Chicago, Ill. June 17–19.

Institute of Government. University of Southern California, Los Angeles, Calif. June 10–14.

International Association of Milk Sanitarians. Joint Meeting with the New York State Association of Dairy and Milk Inspectors. Hotel Pennsylvania, New York, N. Y. October 17–19.

International Association of Public Employment Services. Kansas City, Mo. May 14–17.

International Congress on Rheumatism—7th. New York, Boston, and Philadelphia. June 1–10.

Interstate Post-Graduate Medical Assembly. Cleveland, Ohio. October 13–19.

Iowa Public Health Association—14th Annual Meeting. Des Moines, Ia. April 30.

Maryland State Department of Health—20th Annual Health Conference, for field and departmental staffs. Baltimore, Md. May 3.

Michigan Public Health Association. Detroit, Mich. October 8–11.

Mother's Day. May 12. Tenth annual nation-wide campaign to make maternity safe—Maternity Center Association, New York.

National Association of County Officials. Houston, Tex. April 10–13.

National Association of Housing Officials. William Penn Hotel, Pittsburgh, Pa. May 15–17.

National Association of Purchasing Agents—Governmental Group. Cincinnati, Ohio. June 3–6.

National Biennial Nursing Convention. Bellevue-Stratford Hotel, Philadelphia, Pa. May 11–18.

National Conference of Social Work. Grand Rapids, Mich. May 26–June 1.

National Conference on State Parks. Starved Rock, Ill., and Spring Mill, Ind. May.

National Education Association. Milwaukee, Wis. June 30–July 4.

National Fire Protection Association. Atlantic City, N. J. May 8–11.

National Posture Week. May 6–11.

National Restaurant Association. Chicago, Ill. October 7–11.

National Safety Council. Chicago, Ill. October 7–11.

National Tuberculosis Association. Hotel Statler, Cleveland, Ohio. June 3–6.

Negro Health Week—26th Annual Observance. March 31–April 7.

New England Health Education Institute. Hartford, Conn. April 15–19.

New Mexico Public Health Association. Albuquerque, N. M. May.

New York State Association of Public Health Laboratories — 24th Annual Meeting. School of Medicine and Dentistry, University of Rochester, Rochester, N. Y. May 20.

New York State Conference of Mayors and Other Municipal Officials. Rochester, N. Y. June 3–7.

Northern Tri-State Medical Association. Battle Creek, Mich. April 9.

Office of Indian Affairs—Navajo Service. Tucson, Ariz. April 15–17.

Ohio Federation of Public Health Officials. Columbus, Ohio. May 24.

Pan American Sanitary Conference—Joint Session with Conference of State and Provincial Health Authorities of North America. Washington, D. C. May 8.

Pan American Union. Celebration of the Fiftieth Anniversary. Washington, D. C. April 14.

Pennsylvania Public Health Association. Philadelphia, Pa. May 23.

Public Health Association of New York City — Annual Meeting. George Washington Hotel, New York, N. Y. Section Meetings, 2:30 P.M., Dinner Meeting, 6:00 P.M.; April 9.

Smoke Prevention Association — 34th Annual Convention. Hotel Statler, St. Louis, Mo. May 21–24.

Society of American Bacteriologists. St. Louis, Mo. December.

South Carolina Public Health Association. Myrtle Beach, S. C. June.

Special Libraries Association. Claypool Hotel, Indianapolis, Ind. June 3–6.

Symposium on Clinical Experience in Nursing. Catholic University of America, Washington, D. C. June 26–27.

Texas Public Health Association. Fort Worth, Tex. Sept. 30–Oct. 2.

Tri-State Conference of Food and Health Officials. Pittsburgh, Pa. October.

Western Branch, American Public Health Association — 11th Annual Meeting. Denver, Colo. June 24–27.

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